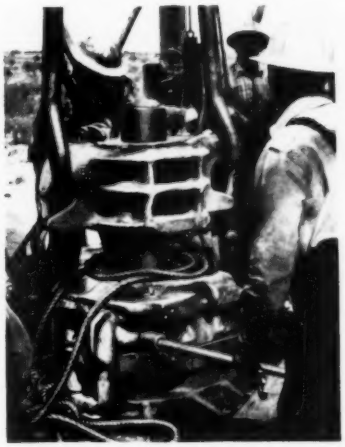
Report on International OIL AND GAS JOURNAL

here's a faster, safer way to handle casing

BJ CASING SPIDER CASING ELEVATOR

WHETHER IT'S 3000 FEET OR 3 MILES, see that your casing jobs have the automatic safety features, pipe-handling ease, and quickly changed slip sizes characteristic of BJ Casing Equipment.



CHECK THESE BJ SPIDER ADVANTAGES

Easy to Use

1. One man operates the automatic lever to set slips.
2. Spider easily removed after pipe is set by opening stirrup-type latch.
3. Replaceable insert-type slips.
4. Slip sizes easily changed.
5. Easy to lubricate alemite fittings and oil cups.

Safer for Crew and Hole

1. Double-locks. Cannot open when string is being supported.
2. Slips must be fully retracted before latch can open.
3. One man operates automatic lever. Stays clear and avoids accidents.
4. Releasing the lever sets slips automatically.
5. Holds the heaviest strings safely.
6. Four 18" slips grip uniformly without crushing, crimping, bottlenecking.

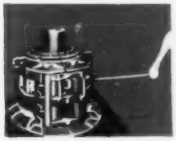
FASTER, SAFER OPERATION WITH THE BJ ELEVATOR

Easy to Use

1. Readily balanced by adjustable balancing blocks.
2. One man easily closes the elevator on the pipe.
3. Elevator can be removed quickly for use on other jobs.
4. Slip-setting lever sets slips quickly at any desired point.
5. Replaceable insert-type slips.

Safer pipe-handling

1. Door cannot open while elevator is loaded.
2. With door closed, neither upset nor coupling can pass through the elevator.
3. Slips may be set manually or will set automatically on contact with collar or upset.
4. Slips may be locked in set position.
5. Four full-length interlocking slips have added safety lock feature.



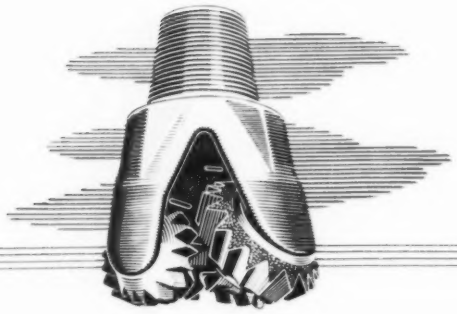
One man actuates the slips with the automatic lever . . . lug on end of lever drops into a slot in the latch and provides an additional safety feature.

Slips are easily set at any desired point by operating the slip-setting lever

FOR MORE OPERATING ADVANTAGES . . . for faster, safer casing handling, specify this BJ Equipment for your own or your contractor's rig. Handles any length string. Handles a wide range of diameters with interchangeable full-length slips. Remember, it's BJ Engineered Oil Tools for better performance on rigs throughout the world. Contact your local BJ representative or write today for the *new* BJ Casing Equipment Bulletin.

BJ
MEANS ENGINEERED OIL TOOLS

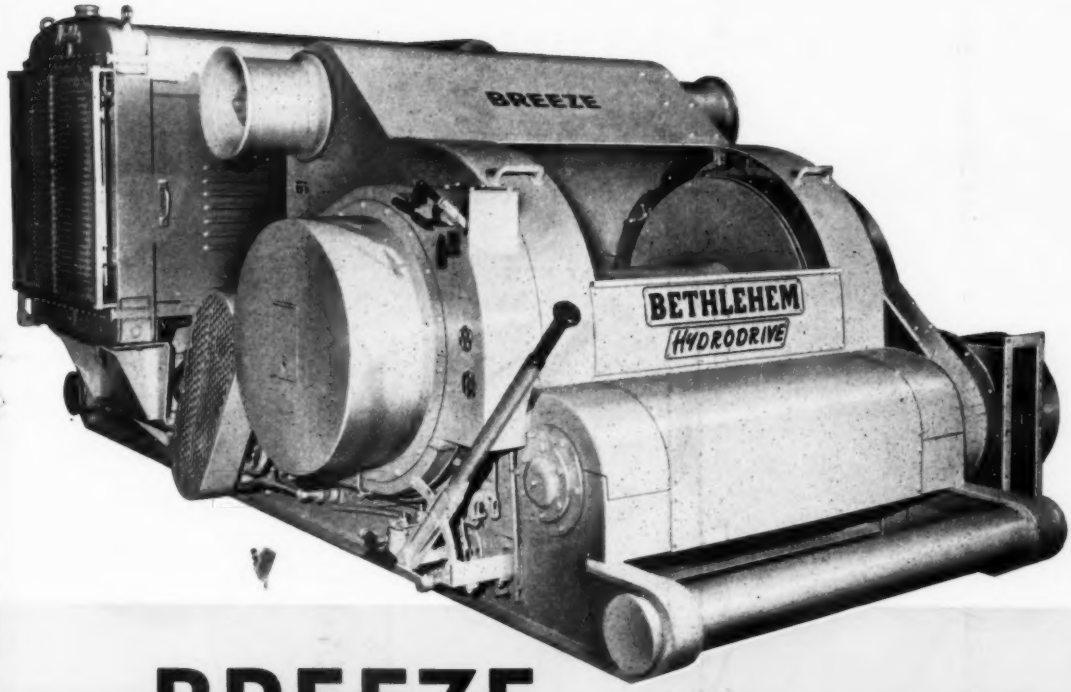
Byron Jackson Co.
Since 1872
MAIN OFFICE AND PLANT, LOS ANGELES 54, CALIF.
Mid-Continent Office and Plant, Houston 1, Tex.
Export Office, New York 17, New York
Branches in All Principal Oil Fields



One of the real joys of Yuletide is the opportunity to put aside the routine and customs of everyday business and in real sincerity wish our friends . . .

GREETINGS of the SEASON

REED ROLLER BIT COMPANY



THE BREEZE... A DUAL-PURPOSE BETHLEHEM HYDRODRIVE UNIT for rotary drilling and workover jobs

This is one of the smoothest performers you'll ever encounter in the small-rig class. It's powerful, too . . . alert, responsive, eager.

The Breeze has two distinct uses: shallow drilling and medium-to-deep workover jobs. It is entirely air-controlled, has self-adjusting clutches, and is Hydrodrive-equipped. This combination means speed, ease of handling, and silky smoothness—all skillfully blended and neatly packaged.

Here's a portable rig that is far more versatile than most. It does so many things, and does them well, that it's the handyman of its class. Not expensive, either. Care for full details? A Bethlehem man will be glad to go over them with you, point by point.

BETHLEHEM SUPPLY COMPANY

General Offices: 21 E. Second Street, Tulsa, Okla.

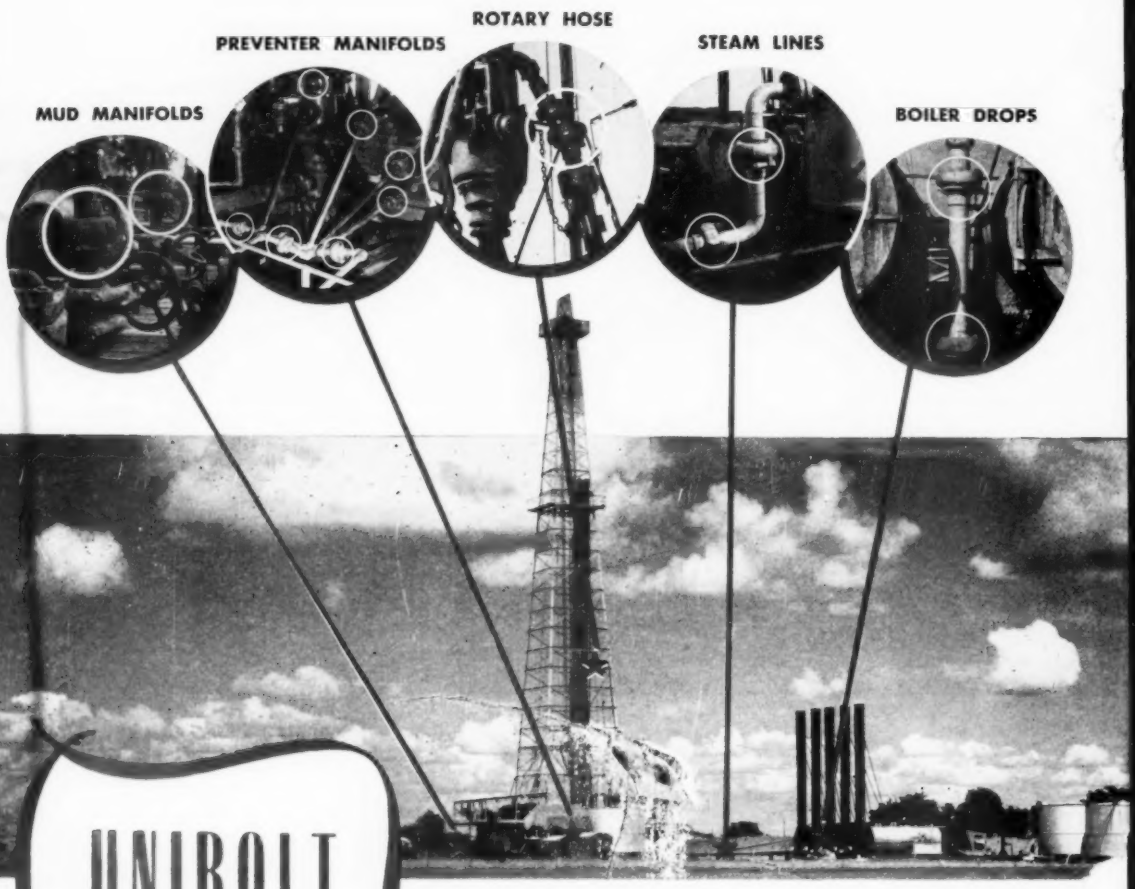
Subsidiary of Bethlehem Steel Corporation

On the Pacific Coast Bethlehem Oil-Field Equipment is sold by Bethlehem Supply Company of California

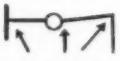
BETHLEHEM STEEL

STRESS-FREE LINES LEAD TO

Economical Rig Maintenance

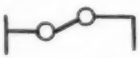


UNIBOLT *Flexi-Ball* JOINTS



STRESS HERE

Using only one Ball Joint does not properly eliminate stress resulting from contraction or expansion.



NO STRESS

Using two Ball Joints in series eliminates stress resulting from contraction or expansion.

The Flexi-Ball Joint, which provides for misalignment up to 38 degrees, depending on the size of the joint, is designed to relieve lines of stress resulting from expansion, vibration, or misalignment. It is a "natural" for flexible manifolds.

The proven UNIBOLT coupling principle is employed to join the component parts of this fitting. As a result, trouble due to galling and freezing of threads is entirely eliminated by the Flexi-Ball design. It is assembled by the simple process of tightening one bolt with an end wrench. Even after extended periods of service, the joint can be quickly dismantled by releasing the bolt.

This fitting may be used safely in any service, since it is made in steel only. Its sizes range from 1½" to 6" and test pressures to 6000 lbs., depending on size; 500 lbs. steam working pressure.

THORNHILL-CRAVER COMPANY

HOUSTON, TEXAS

Can you guess which V belt will last 20 to 50% longer?

THE cross-section on the right is from an ordinary type of V belt; that on the left is from a B.F.Goodrich *grommet* V belt. Both belts are the same size — "E" sections. Both cost the same. Yet the BFG grommet belt may outlast the other from 20 to 50%! Here's why —

No cord ends — A grommet is endless, made by winding heavy cord on itself to form an endless loop. It has no overlapping ends (as in an ordinary V-belt cord section), no stiff, weakened section of "spliced" cord. Because most of the failures in ordinary V belts occur in the region where cords overlap, the endless cord section in a grommet V belt eliminates such failures.

Concentrated cord strength — All of the cord material in a B.F.Goodrich grommet V belt is *concentrated* in twin grommets, positioned close to the driving faces of the pulley. This eliminates "dishing" of cords in the center of the belt, insures full use of all cord strength, maximum power delivery, even load distribution. No layers of cords to rub against one another and generate heat; cord and adhesion failures are reduced.

Better grip, less slip — Because a grommet is endless, free of stiff overlap, a grommet V belt is more flexible, grips the pulleys better. Size for size, grommet V belts will give ⅓ more gripping power, pull heavier loads with a higher safety factor.

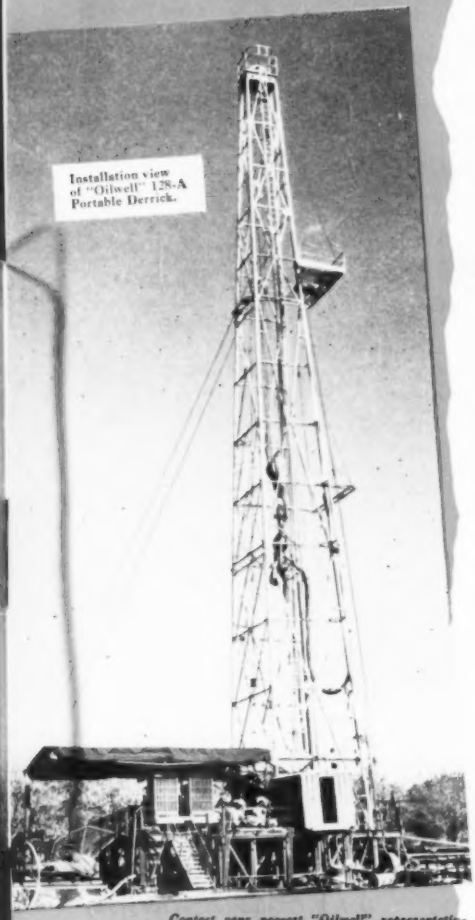
Only B.F.Goodrich has the grommet! — Twin grommet construction is an exclusive, patented B.F.Goodrich feature — no other V belt is a grommet V belt. (U. S. Patent No. 2,233,294) To get genuine grommet V belts (at present made in D and E sections only) see your local B.F.Goodrich distributor. Ask him to show you his "X-ray" belt that illustrates grommet construction clearly. *The B.F.Goodrich Company, Industrial and General Products Division, Akron, Ohio.*

Grommet V Belts BY

B.F.Goodrich

Drillers go for its *Portability*

. . . the "Oilwell" Easy-to-Assemble, Easy-to-Erect, Easy-to-Move 128-A PORTABLE DERRICK — with "Oilwell's" 64-B POWER RIG and Companion Equipment



Installation view of "Oilwell" 128-A Portable Derrick.

THE "Oilwell" 128-A Portable Derrick with capacity rating of 450,000 pounds is a time-saver for medium drilling operations. Easily assembled and dis-assembled on the ground, this derrick can be moved in three major sections. If it is not necessary to maintain an 8-foot road clearance, the assembled derrick can be transported as a unit by a truck and two trailers.

Users find the "Oilwell" 128-A Derrick with 64-B Power Rig and companion equipment a proven drilling outfit for fast, economical operations.

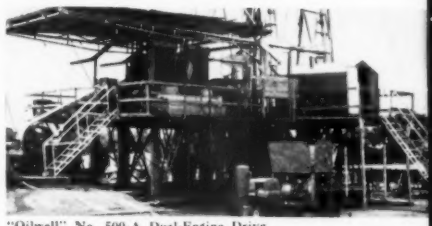
COMPLETELY PORTABLE "OILWELL" 128-A DERRICK . . . is constructed from tubular seamless steel and so designed that the drilling line is located inside the rear derrick legs, enabling the driller to keep sight of the traveling block at all times.

STURDY, HIGHLY FLEXIBLE "OILWELL" NO. 64-B DRAW WORKS . . . is designed for drilling to 7,500 feet with 3½-inch drill pipe and to 6,000 feet with 4½-inch drill pipe. It is easy to service and responds instantly through air-operated controls. Draw Works with drive can be transported as a unit.

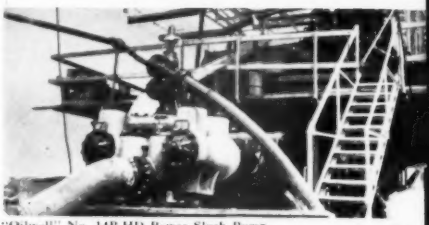
"OILWELL'S" COMPACT SINGLE-ENGINE AND DUAL-ENGINE DRIVES . . . consist of internal-combustion engines with selective compounding mechanism. The "Oilwell" No. 500-A Dual-Engine Drive with 500 h.p. rating and the "Oilwell" No. 300-A Single-Engine Drive with 300 h.p. rating operate both draw works and slush pump. The "Oilwell" No. 200-A Single-Engine Drive with 200 h.p. rating operates only the draw works.

CONSTRUCTION OF "OILWELL'S" NO. 14P-HD POWER SLUSH PUMP . . . is based on field-proved design principles, with modern refinements contributing to high operating efficiency and low upkeep.

"Oilwell" No. 64-B Draw Works.



"Oilwell" No. 500-A Dual-Engine Drive.



"Oilwell" No. 14P-HD Power Slush Pump.

Contact your nearest "Oilwell" representative for complete specifications on the 128-A Portable Derrick, the No. 64-B Power Rig and its companion equipment . . . all engineered to work together.

OIL WELL SUPPLY COMPANY

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Designed for corresponding drilling depths are—"Oilwell" 66-inch Streamline Traveling Block and the "Oilwell" 6-Sheave Crown Block . . . modern, streamlined "Oilwell" 200-ton (No. S5-200) Swivel . . . "Oilwell" No. 1717C Rotary Drilling Unit or No. 17½-C Oilbath Rotary . . . and keep in mind that "Oilwell" is a good place to buy all your supplies including: American TIGER BRAND Wire Lines • National Tube Company Tubular Goods.

USS "OILWELL"

UNITED STATES STEEL

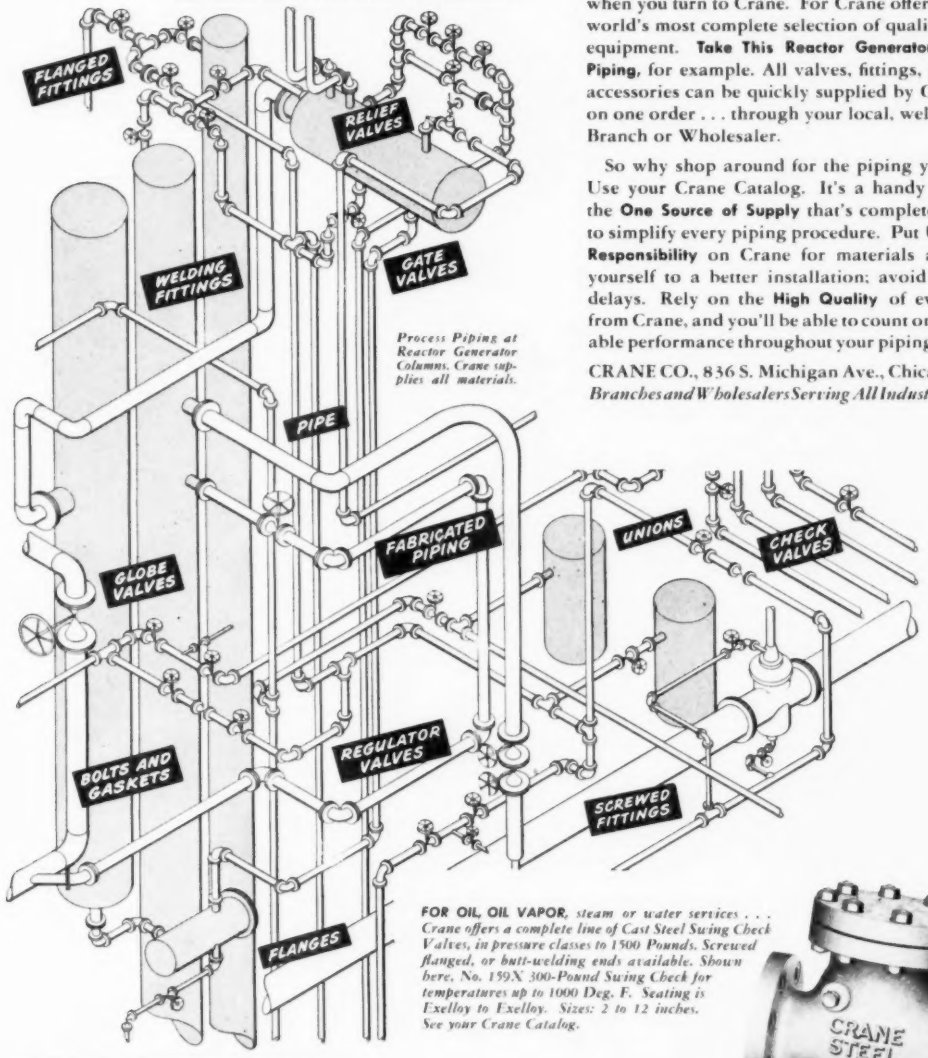
If it's piping equipment for refineries ...It's in the CRANE line

ONE SOURCE OF SUPPLY
RESPONSIBILITY
STANDARD OF QUALITY

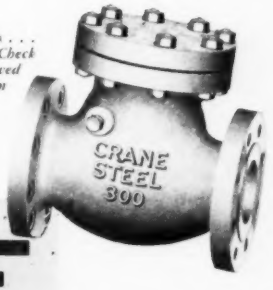
Whether you need piping for power, process or general service installations, you can't go wrong when you turn to Crane. For Crane offers you the world's most complete selection of quality piping equipment. **Take This Reactor Generator Column Piping,** for example. All valves, fittings, pipe and accessories can be quickly supplied by Crane . . . on one order . . . through your local, well-stocked Branch or Wholesaler.

So why shop around for the piping you need? Use your Crane Catalog. It's a handy index to the **One Source of Supply** that's complete enough to simplify every piping procedure. Put **Undivided Responsibility** on Crane for materials and help yourself to a better installation; avoid needless delays. Rely on the **High Quality** of every item from Crane, and you'll be able to count on dependable performance throughout your piping systems.

CRANE CO., 836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas



Process Piping at Reactor Generator Columns. Crane supplies all materials.



FOR OIL, OIL VAPOR, *steam or water services . . . Crane offers a complete line of Cast Steel Swing Check Valves, in pressure classes to 1500 Pounds. Screwed flanged, or butt-welding ends available. Shown here, No. 159X 300-Pound Swing Check for temperatures up to 1000 Deg. F. Seating is Exelloy to Exelloy. Sizes: 2 to 12 inches. See your Crane Catalog.*

EVERYTHING FROM . . .

VALVES • FITTINGS
PIPE • PLUMBING
AND HEATING

CRANE

FOR EVERY PIPING SYSTEM

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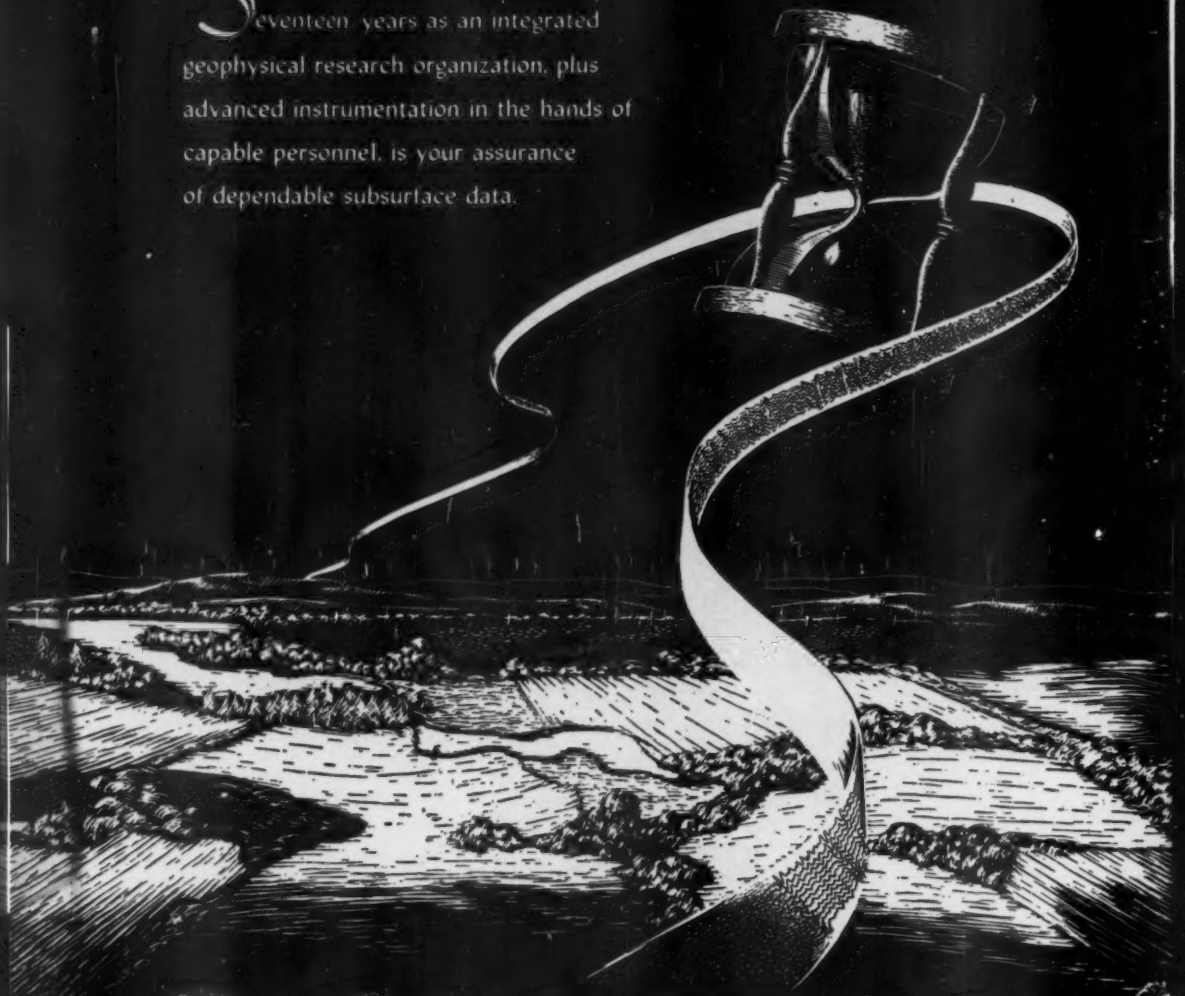
Seventeen years as an integrated geophysical research organization, plus advanced instrumentation in the hands of capable personnel, is your assurance of dependable subsurface data.



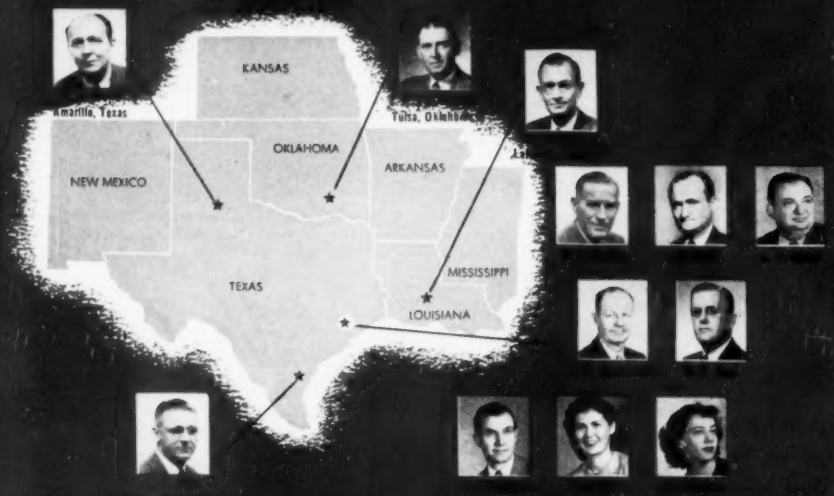
SEISMIC

EXPLORATIONS, INCORPORATED

1007 SOUTH SHEPHERD DRIVE HOUSTON, TEXAS

Established 1932

Season's Greetings from GROVE



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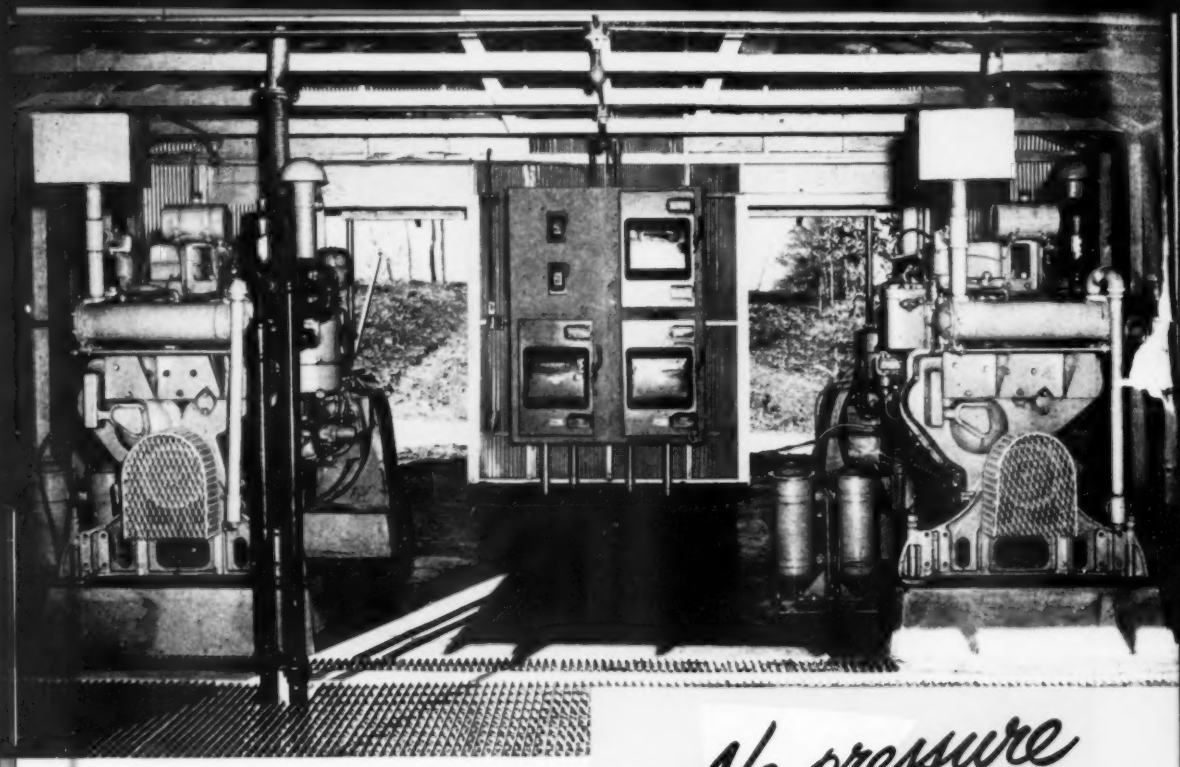
GROVE — GROVE "PUTS PRESSURE TO WORK" — **VALVES and REGULATORS**



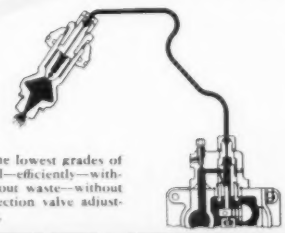
No pressure let-up here

. . . with "Caterpillar" Diesels on the job

PRESSURE keeps up on pressure-pumping operations because "Caterpillar" Diesels themselves hardly know what it is to let up. Known the world over for dependability, they are establishing records of tens of thousands of hours of constant low-cost service.

"Cat" Diesels are ideally suited for repressuring jobs. The crude oil burning D13000 Electric Sets, shown here, are equipped with 125-kva. generators. They power two 75-hp. high-pressure pumps, two 75-hp. low-pressure pumps, lights, heater and centrifuge for crude oil fuel. Even with only one electric set in action (while the other stands by), approximately 14,000 barrels of water are pumped daily through a distributing system of about 145 injection wells — at approximately 400 pounds per square inch surface pressure. Together they can pump 20,000 barrels per day from a depth of 100 feet. They work for the Pure Oil Company in the Bellair Pool, Crawford County, Illinois.

CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS



Highlighting the finely engineered construction of "Cat" Diesel Engines is the all-"Caterpillar" fuel system. With it, the lowest grades of fuel can be burned—efficiently—without fouling—without waste—without fuel pump or injection valve adjustments of any kind.

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REG. U.S. PAT. OFF.
OILFIELD ENGINES
TRACTORS • MOTOR GRADERS • EARTHMOVING EQUIPMENT

CATERPILLAR TRACTOR CO., Dept. OG-12, Peoria, Ill.
Send me your latest oilfield booklet, "Oilfield Hands."

Name _____

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world-wide acceptance!
All over the world, oil men have accepted the superior performance of BS&B's Volume Type Heater, most popular in the complete line of BS&B unit heaters. Now, BS&B proudly presents a new catalog on these unit heaters which is a complete guide to multi-unit treating. (Turn page for further details)
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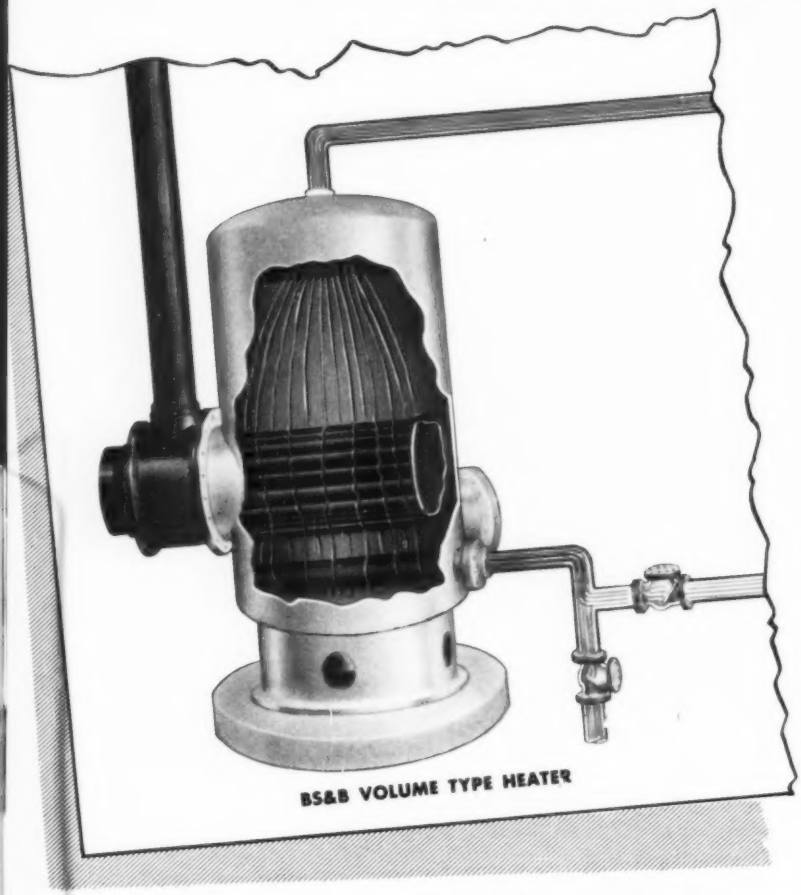
Oklahoma City
EFFICIENCY
BS&B
RELIABILITY



(*at left*) A portion of a 10" x 14", full-color illustration from BS&B's new Unit Heater catalog. This illustration shows how BS&B Volume Type Heaters may be used in a forced flow treating system. The 4-color process illustration shows cutaways of a volume type heater and a wood treating tank. The paths of emulsion and oil, treated oil, water, and gas are traced through the system by color. This is just one of eight large, full-color illustrations in this new catalog.

a complete guide to multi-unit treating!

IN BS&B'S NEW UNIT HEATER CATALOG

It's not just a catalog listing of products—it's a complete guide to multi-unit treating! BS&B's new Unit Heater catalog, just off the press, is a guide-book you'll want to keep for ready reference.

It's a 36-page catalog containing eight 10" x 14", full-color illustrations. Four of these jumbo illustrations are cutaways of the four types of BS&B Unit heaters. The four others are cutaways of multi-unit treating systems. Across from each illustration is a complete description of how the system operates—down to the last detail.

First, you will read a general discussion of multi-unit treating systems. This section is illustrated with several pictures of actual installations. Then, each system is analyzed . . . its advantages and disadvantages . . . exactly how it works . . . which heater is best suited. Across from each of these sections are the large, four-color illustrations, fully labeled, easy to follow.

Each type of BS&B unit heater is discussed . . . how it's built . . . how it operates . . . features . . . capacities and specifications. Nothing has been omitted from this catalog that will help you choose the right heater for your special job. If you use any of the following in your operations, you will be interested in a discussion of how BS&B unit heaters can be used for special applications involving them—Heating stock tanks—"Glycol Type" dehydration plants—Gas sweetening plants—Gasoline plants—Steam generators—Batch treating.

BS&B UNIT HEATERS

Black, Sivalls & Bryson, Inc., Oil Field Equipment Division, 720 Delaware, Kansas City 6, Mo.

- ☐ **Please rush me my copy of BS&B's new unit heater catalog.**
- ☐ **Please have a BS&B Sales Engineer deliver my copy of the catalog.**

Name_____

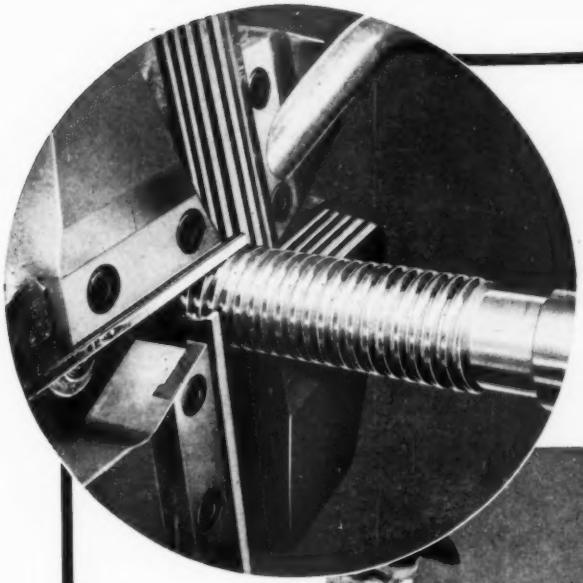
Address_____

GET THIS NEW CATALOG NOW!

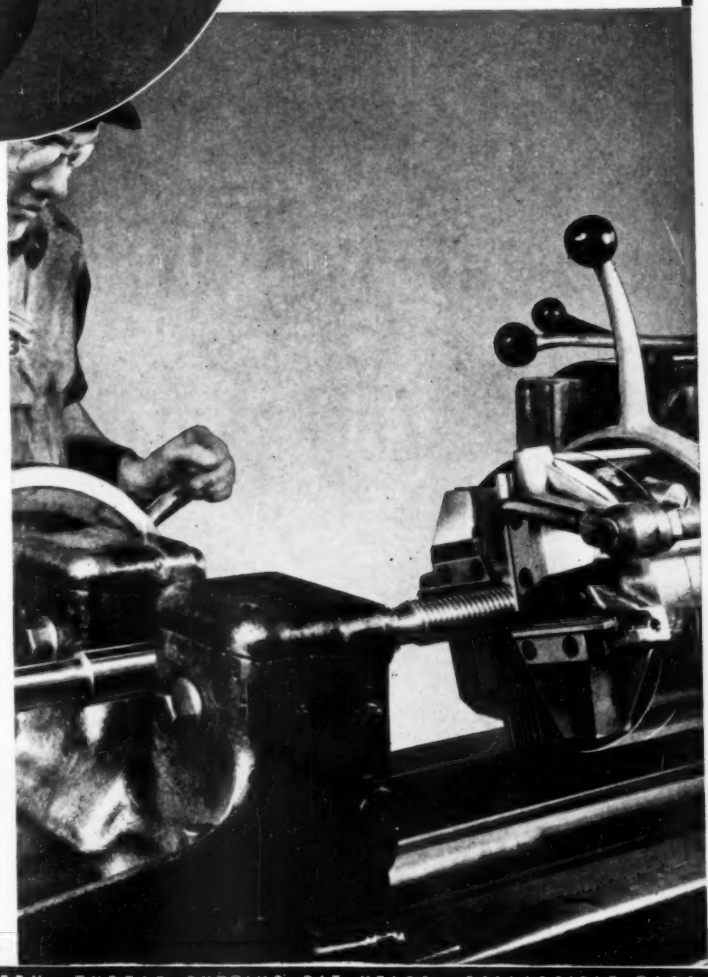
Just fill out and mail the coupon for immediate delivery of your copy of the new BS&B Unit Heater Catalog.

BLACK, SIVALLS & BRYSON, INC.

KANSAS CITY, MISSOURI



94.2% SAVING IN Threading Time



Right- and left-hand Threads in 4.66 min.

• 79.71 minutes formerly were required to cut threads on both ends of vise screws. The 1⅝" 4 pitch Acme threads 5¼" long on each end are now cut in one pass in 4.66 minutes floor-to-floor time, using a Landmaco Threading Machine equipped with Lead-screw Attachment.

In finishing 12.9 pieces per hour, the machine is operated at a cutting speed of 21 surface feet per minute at 57 R.P.M. This large eastern manufacturer states that "production is increased 1710% over best methods previously used."

Write for Bulletin H-75.

LANDIS
Machine
COMPANY
WAYNESBORO
PENNA. • U.S.A.

THREADING MACHINERY—THREAD CUTTING DIE HEADS—COLLAPSIBLE TAPS

Represented in the Domestic Oil Fields by: **Colcord-Wright Machinery & Supply Co., St. Louis, Mo.; C. J. Harter Machinery, Houston, Texas; Frederic-Baker Co., New Orleans, La.; Moore Machinery Co., Los Angeles and San Francisco, Calif.; Hendrie & Bolthoff Mfg. & Supply Co., Denver, Colo.**

MODERN EQUIPMENT
TRAINED CREWS
EXPERT INTERPRETATION
. . . to get the information you want
Accurate, comprehensive results in seismic exploration do not just happen . . . they are obtained from modern equipment manned by highly trained crews and expert interpretation that comes only through experience.
McCollum Exploration has been a leader in seismic exploration for over 25 years.
McCOLLUM EXPLORATION CO.
DOMESTIC AND FOREIGN EXPLORATION
Pioneers in
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WELL SHOOTING • MARINE SHOOTING
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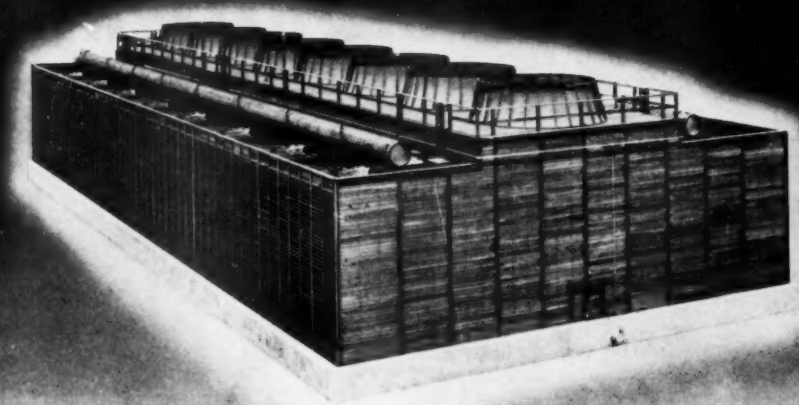
Specify MARLEY Double-Flow



WITH THE OPEN DISTRIBUTION SYSTEM

Marley Double-Flow Cooling Towers have an Open Distribution System.

And why is that important?

Because the Marley Open Distribution System is . . .

EASY TO INSPECT . . . it's on top of the tower, in broad daylight, never hidden from view.

EASY TO REGULATE . . . a widely varying GPM may be circulated over the tower without revamping the distribution system.

EASY TO CLEAN . . . cleaning is done with an ordinary broom . . . it is not necessary to shut down the tower or take it apart in any way.

UNUSUALLY SAFE . . . no climbing through small portholes, across slippery members . . . no danger of falling through the filling while crawling about in narrow spaces in semi-darkness while inspecting or cleaning.

VERY ECONOMICAL . . . because it's easy to clean . . . and clean distribution systems insure top performance and low operating costs. Also, the diffusion decking underneath gives excellent water break-up with no added pumping head.

Ask for a MARLEY Factory-Trained APPLICATION ENGINEER to tell you more about the MARLEY DOUBLE-FLOW Cooling Tower with the OPEN DISTRIBUTION SYSTEM. He'll be glad to help you solve YOUR water cooling problems. No cost or obligation.

MARLEY COOLING TOWERS

THE MARLEY COMPANY, INC. • KANSAS CITY 15, KANSAS

NEW! The JOY #150 MOTORIZED DRILL RIG

Latest in Design First in Performance

JOY'S new #150 Motorized Drill Rig is designed for heavy-duty seismograph, electrical logging, structure testing and shallow water well drilling down to 1500 feet. It incorporates the most modern improvements in drill rig design—has proved itself outstanding in the field within its capacity range. Note these exclusive features:

- ★ **All chains are oil-bath lubricated and run in oil-tight cases.**
- ★ **Equipped with conventional oil-bath rotary table with 6⅜" opening. For running larger casing, the rotary table is retractable 14 inches.**
- ★ **Mast elevating and lowering cylinders are arranged to eliminate over-travel on either the up or down stroke.**
- ★ **Main drum clutch and sand-reel clutch use same friction plates.**

WRITE FOR BULLETIN

Consult a Joy Engineer

W&D 02195

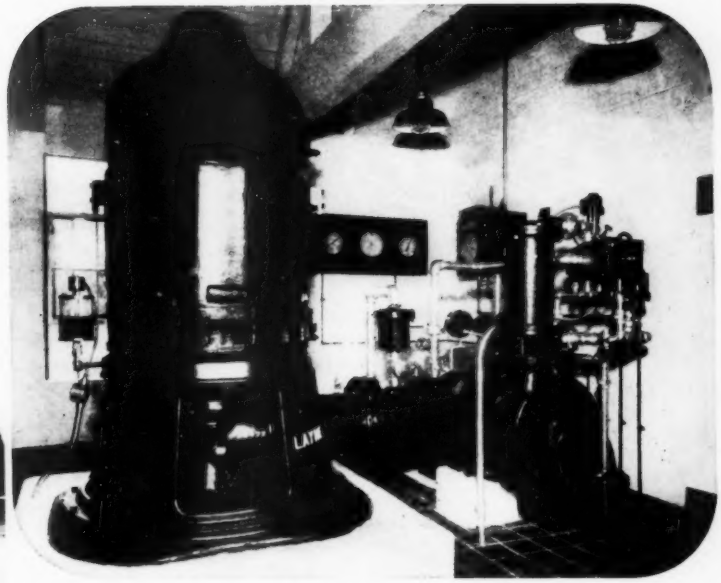
The efficient and highly portable #150 Motorized Drill Rig on the job.

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

"Better Built—
for Better Service"



ABOUT DISCARDING OLD PUMPS

Your old, worn out and expensive to operate pumps can be replaced with the famous Layne Vertical Turbines to obtain a greater volume of water at substantially lower operating cost. Sizes range from 40 to 16,000 gallons per minute. Drives may be by electric motor, gas, gasoline, Diesel or steam engine—or by steam turbine. Send for the Layne Vertical Turbine Pump catalog.

WHAT'S SO IMPORTANT ABOUT HIGH EFFICIENCY

High efficiency is the one and only feature that can keep water system operation cost low—and profitable. Layne can claim the highest of all on today's market. Certainly no other is backed up by so many years of skillful engineering and advanced design. Nor is there any other that has finer quality of materials or more ruggedness of construction;—none that consistently give so many years of highly satisfactory service.

Layne's methods of building well water systems come from nearly three-quarters of a century of world-wide experience. Layne is acknowledged to have the "know how" that omits guess work, disappointment in needed volume and patch ups in construction errors by the less experienced. Layne systems, size for size, are built to, and actually do produce more water than can be obtained by the conventional type of installation.

It is good business to make high efficiency a yardstick in buying a well water system. It is good to know that from Layne you automatically obtain the high efficiency that continually keeps your water production at rock bottom cost. In choosing a Layne system you are following the preference of thousands of cities and industries in all parts of the world. For further information, catalogs, etc., address

LAYNE

LAYNE & BOWLER, INC.
GENERAL OFFICES, MEMPHIS 8, TENN.

WELL WATER SYSTEMS

ASSOCIATED COMPANIES—Layne-Arkansas Co., Stuttgart, Ark. ★ Layne-Atlantic Co., Norfolk, Va. ★ Layne-Central Co., Memphis, Tenn. ★ Layne-Northern Co., Mishawaka, Ind. ★ Layne-Louisiana Co., Lake Charles, La. ★ Louisiana Well Co., Monroe, La. ★ Layne-New York Co., New York City ★ Layne-Northwest Co., Milwaukee, Wis. ★ Layne-Ohio Co., Columbus, Ohio ★ Layne-Pacific, Inc., Seattle, Wash. ★ The Layne-Texas Co. Ltd., Houston, Tex. ★ Layne-Western Co., Kansas City, Mo. ★ Layne Minnesota Co., Minneapolis, Minn. ★ International Water Corp., Pittsburgh, Pa. ★ International Water Supply, Ltd., London, Ont. ★ Layne-Hispano Americana, S.A., Mexico, D. F. ★ General Filter Company, Ames, Iowa.

Get longer service in corrosive wells with . . .

Sucker Rods of "K" Monel

Replacing strings because of sucker rod failure is expensive.

But it's no longer a necessary evil. "K"* Monel sucker rods have seen to that! They last for years in wells where other rods fail in weeks.

Serving in some of the most corrosive areas of West Texas, for example, "K" Monel rods have bucked a wide range of sour crudes and brines – and won out *every time.* (Three typical case histories are briefly reviewed in the panel at the right.)

"K" Monel, in addition to providing such high resistance to corrosive media, also resists abrasion and wear. It withstands stress, vibration and flow-cutting.

High Fatigue Strength

And "K" Monel has other important features, too. It can be used under the conditions existing in oil and gas wells without significantly accelerating corrosion of the steel equipment with which it comes in contact. Nor is its fatigue strength significantly affected by the presence of oil well corrosives.

Heat-treatable and non-magnetic, "K" Monel's tensile strength can be developed to 140-170,000 psi, and its hardness to 25-35 Rockwell "C." Thus you get strength and hardness comparable to heat-treated alloy steels – and you have all the corrosion-resisting, wear-resisting properties of "K" Monel besides!

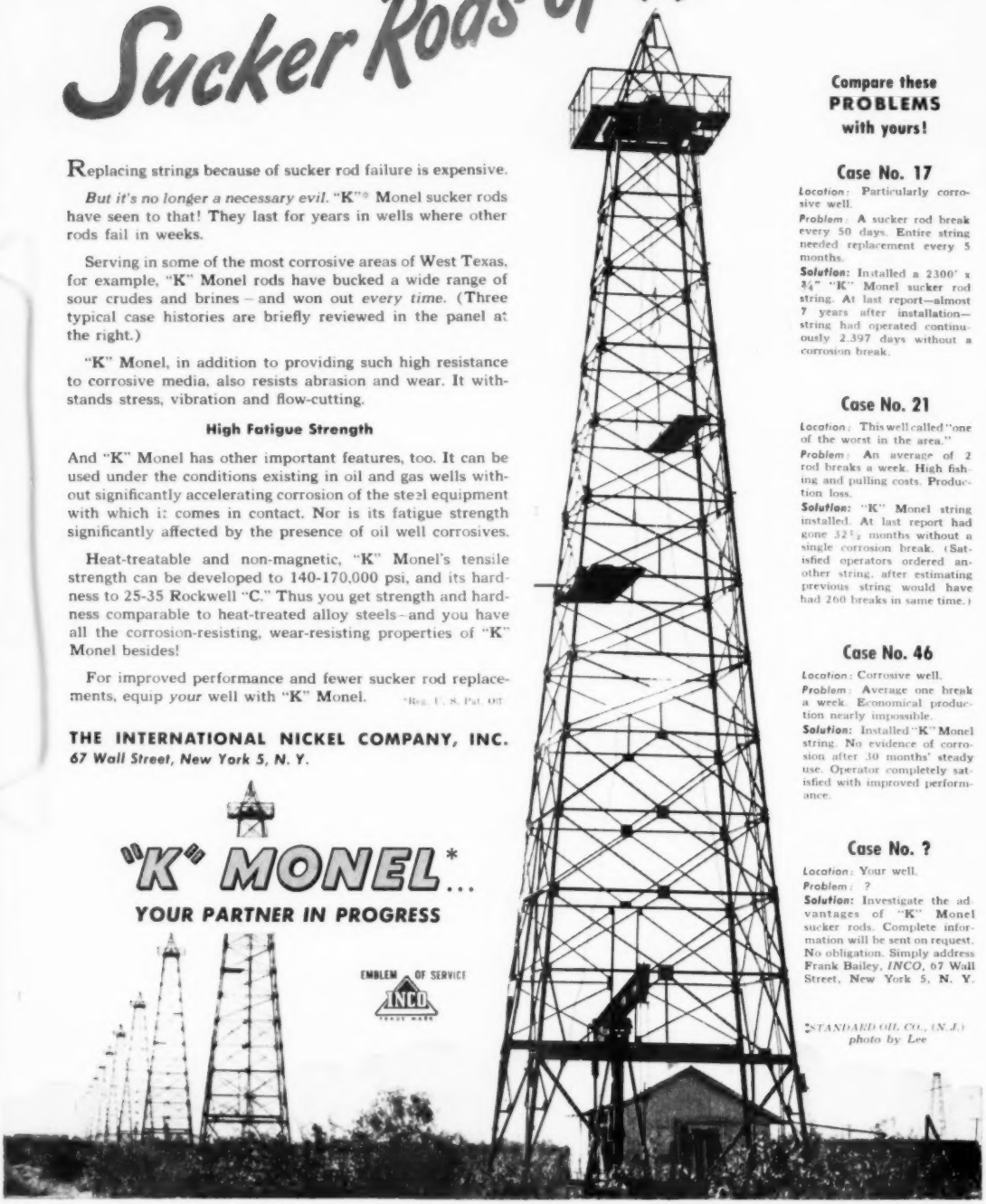
For improved performance and fewer sucker rod replacements, equip *your* well with "K" Monel.

*Reg. U. S. Pat. Off.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.

"K" MONEL*...
YOUR PARTNER IN PROGRESS

EMBLEM OF SERVICE
INCO
TRADE MARK



Compare these PROBLEMS with yours!

Case No. 17

Location: Particularly corrosive well.

Problem: A sucker rod break every 50 days. Entire string needed replacement every 5 months.

Solution: Installed a 2300' x ¾" "K" Monel sucker rod string. At last report—almost 7 years after installation—string had operated continuously 2,397 days without a corrosion break.

Case No. 21

Location: This well called "one of the worst in the area."

Problem: An average of 2 rod breaks a week. High fishing and pulling costs. Production loss.

Solution: "K" Monel string installed. At last report had gone 32½ months without a single corrosion break. (Satisfied operators ordered another string, after estimating previous string would have had 260 breaks in same time.)

Case No. 46

Location: Corrosive well.

Problem: Average one break a week. Economical production nearly impossible.

Solution: Installed "K" Monel string. No evidence of corrosion after 30 months' steady use. Operator completely satisfied with improved performance.

Case No. ?

Location: Your well.

Problem: ?

Solution: Investigate the advantages of "K" Monel sucker rods. Complete information will be sent on request. No obligation. Simply address Frank Bailey, *INCO*, 67 Wall Street, New York 5, N. Y.

*STANDARD OIL CO., (N.J.) photo by Lee

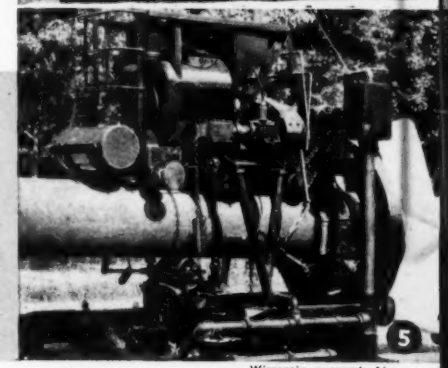
WISCONSIN HEAVY-DUTY Air-Cooled ENGINES

AT YOUR SERVICE . . . for the Most Dependable and Versatile Power Service

Wherever there is power work to be done, within a 2 to 30 hp. range, you will find Wisconsin Heavy-Duty Air-Cooled Engines delivering "Most HP. Hours" of on-the-job service, with the least amount of human attention, at the lowest operating and maintenance costs, on a great variety of oil field applications.

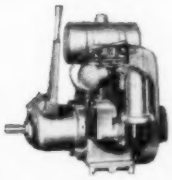
Positive, trouble-free AIR-COOLING is, of course, a major Wisconsin Engine advantage . . . providing complete freedom from cooling problems at any location, in any climate . . . operating efficiently at temperatures from sub-zero, F., to 140° F. Heavy-Duty service features such as Timken tapered roller bearings at BOTH ends of the rugged, drop-forged crankshaft on all models, to take up end- and radial-thrusts and provide maximum protection against bearing failure, are assurance of full-duty dependability and extremely low maintenance costs.

Wisconsin Heavy-Duty Air-Cooled Engines are available in a complete power range from 2 to 30 hp., in 4-cycle single cylinder, 2 cylinder and V-type 4-cylinder models. Wisconsin Engine distributors, strategically situated throughout the world, are at your service. We invite your inquiries. *In the United States, consult Harley Sales Co., Tulsa, Okla., and Houston, Texas, oil field distributors for Wisconsin Engines and all types of utility units.*

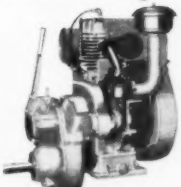


SPECIAL OIL FIELD FEATURES

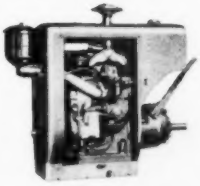
- **SPECIAL HEADS AND VALVES** can be provided for all models when natural gas of varying heat value is used as fuel.
- **EXTRA-HEAVY FLYWHEELS** are available for some models used in oil well pumping.
- **SPECIAL FITTINGS** permit all Wisconsin Engines to operate most successfully on either gasoline or natural gas with only the slightest adjustments.
- **STARTING EQUIPMENT** . . . either crank, special rope starter sheaves or electric starting. Standard starting equipment includes automatic impulse magneto coupling for a fast, hot spark, timed for safety and quick starting.
- **IGNITION.** A weather-proof, high tension rotary type outside magneto, mounted in a position where it is free from oil, grease and dirt and readily accessible for adjustment, provides positive, dependable firing and full power delivery.
- **SPECIAL MECHANICAL FEATURES.** All of the larger oil field engines are equipped with Stellite Valves and inserts, and geared lubrication pumps deliver an individual oil stream to each rod.



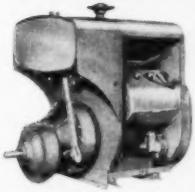
4-cycle single cylinder, 2 to 6 hp.



Single cylinder, 6 to 9 hp.

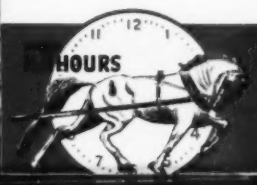


2-cylinder Power Unit, 7 to 13 hp.



V-type 4-cylinder Power Unit, 15 hp. to 30 hp. models.

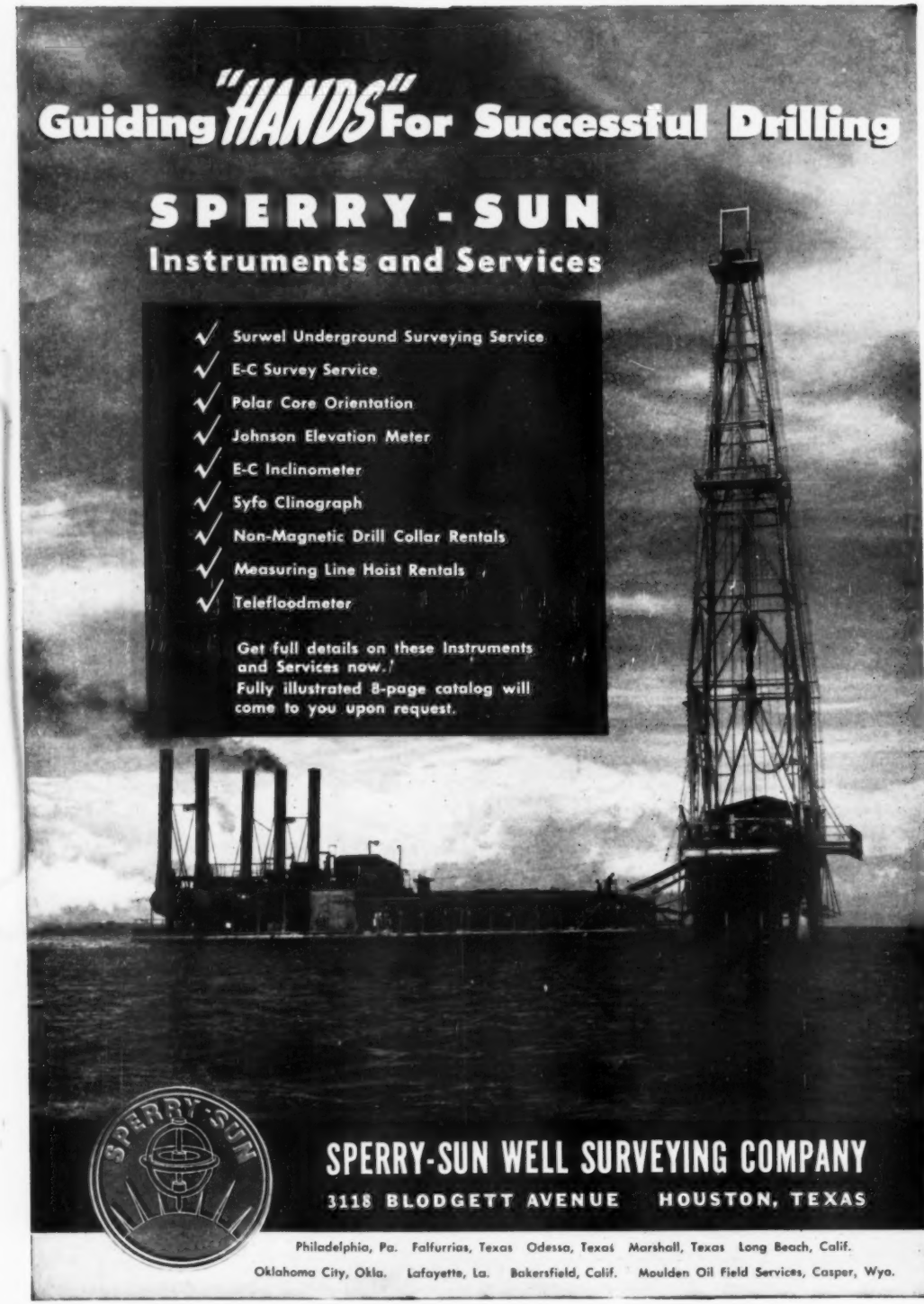
1. Wisconsin-powered Airborne Pump, carried by helicopter.
2. Wisconsin-powered high pressure pumping unit handling crude oil.
3. Wisconsin-powered "Swamp Buggy", used by geological and exploratory crews.
4. Wisconsin-powered pipe-straightening machine reconverting used pipe for further service.
5. Wisconsin-powered Pipe Wrapping Machine, wraps pipe with asbestos or glass paper, for prevention of corrosion.



WISCONSIN MOTOR CORPORATION

World's Largest Builders of Heavy-Duty Air-Cooled Engines

MILWAUKEE 14, WISCONSIN, U.S.A. Cable Address: "WISCONSIN"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SPERRY-SUN
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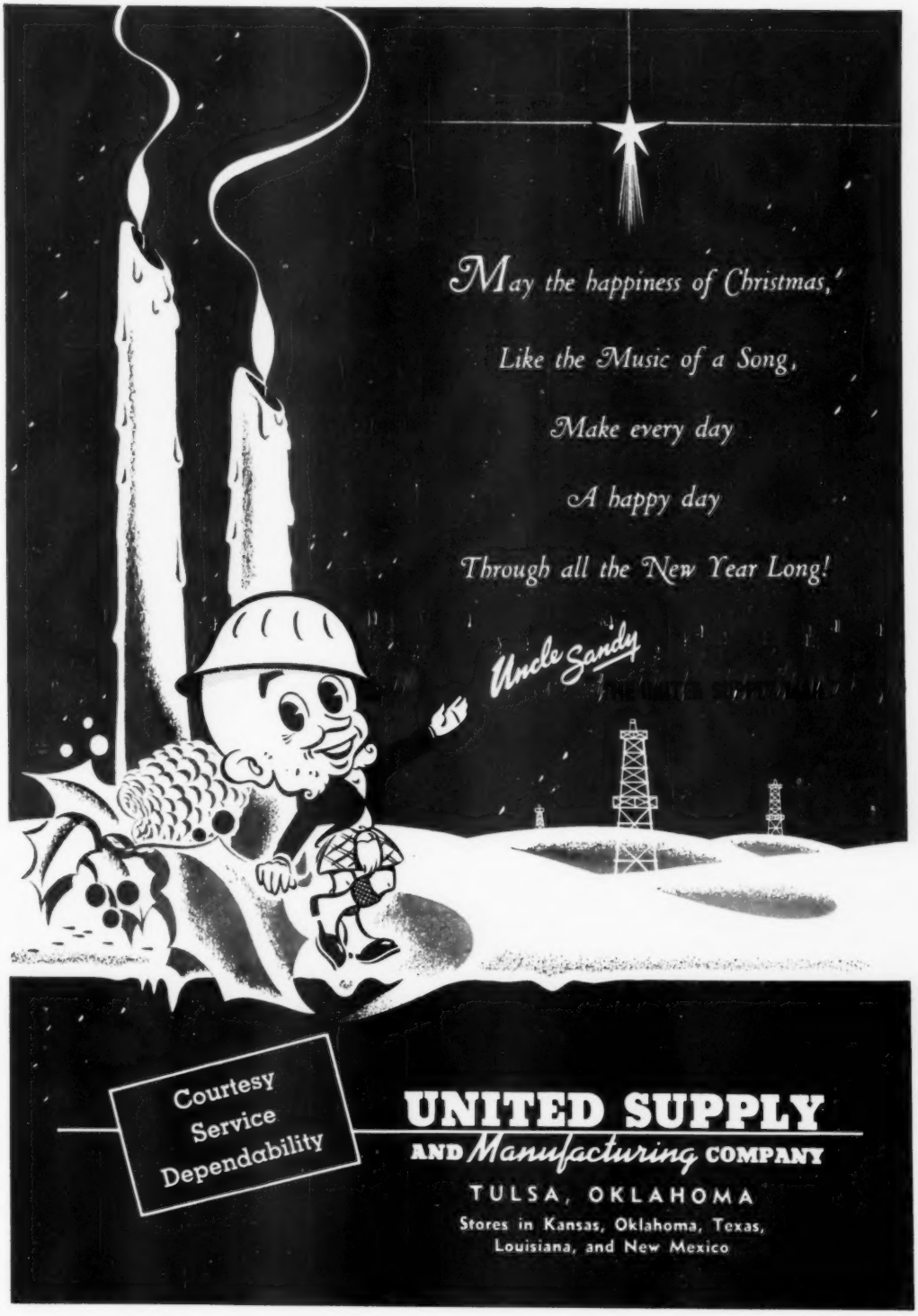
√ Polar Core Orientation
√ Johnson Elevation Meter
√ E-C Inclinometer
√ Syfo Clinograph
√ Non-Magnetic Drill Collar Rentals
√ Measuring Line Hoist Rentals
√ Telefloodmeter
Get full details on these Instruments and Services now.
Fully illustrated 8-page catalog will come to you upon request.
SPERRY-SUN WELL SURVEYING COMPANY
3118 BLODGETT AVENUE HOUSTON, TEXAS
Philadelphia, Pa. Falfurrias, Texas Odessa, Texas Marshall, Texas Long Beach, Calif.
Oklahoma City, Okla. Lafayette, La. Bakersfield, Calif. Moulden Oil Field Services, Casper, Wyo.


May the happiness of Christmas,
Like the Music of a Song,
Make every day
A happy day
Through all the New Year Long!
Uncle Sandy
Courtesy
Service
Dependability
UNITED SUPPLY
AND Manufacturing COMPANY
TULSA, OKLAHOMA
Stores in Kansas, Oklahoma, Texas,
Louisiana, and New Mexico

PROOF - *not Guesswork*

Makes FWD America's Foremost Heavy-Duty Truck

Here's actual operating proof in oil field service. This FWD — twisting over rough off-the-road terrain to get to location — is doing a regular job for one of the nation's leading oil companies. Going such as this demands trucks that get you there. It demands trucks you can rely on every day. It demands FWDs.

Yes— you can be sure with an FWD even before you buy. Here's why. FWD trucks are scientifically tested on FWD's proving ground to twist over ditches — 18 inches deep. *No wonder many of the world's leading oil field operators standardize on FWDs with individual fleets of over 600 units.*

WHAT FWDs DO ON THE PROVING GROUND
1 Highball over hilly curved roads!
2 Slog thru mud — up to the bumper!
3 Speed over 100-ft. unbanked circle!
4 Twist over ditches — 18 inches deep!
5 Drive up 6% grade thru 3-ft. of sand!
6 Climb 70% grade from dead stop!
7 Climb 8-in. beam from standstill!
8 Drill pole holes to prove equipment!
9 Speed safely over level highways!
1
2
3
5
6
7
8
9

This is FWD's proving ground. This is your assurance that the FWD you select has the stamina to insure long life without expensive mechanical breakdowns.

An FWD twists over 18-inch ditches on the proving ground. For all the facts, see your FWD distributor— or write FWD direct.

An Invitation To Truck Buyers

We invite you to watch FWDs pass a series of rigid performance tests. Ask your FWD distributor to arrange your visit to our plant. Or — if you can't get away, ask him to show you the movie, *The FWD Story*. In either case, you will see for yourself how FWD trucks can help solve your heavy-duty trucking problems.

Martin O. Close
President
The Four Wheel Drive Auto Company

THE FOUR WHEEL DRIVE AUTO COMPANY
Clintonville, Wis. • *Canadian Factory:* Kitchener, Ontario
FOUR AND SIX WHEEL DRIVE TRUCKS

America's Foremost Heavy-Duty Truck

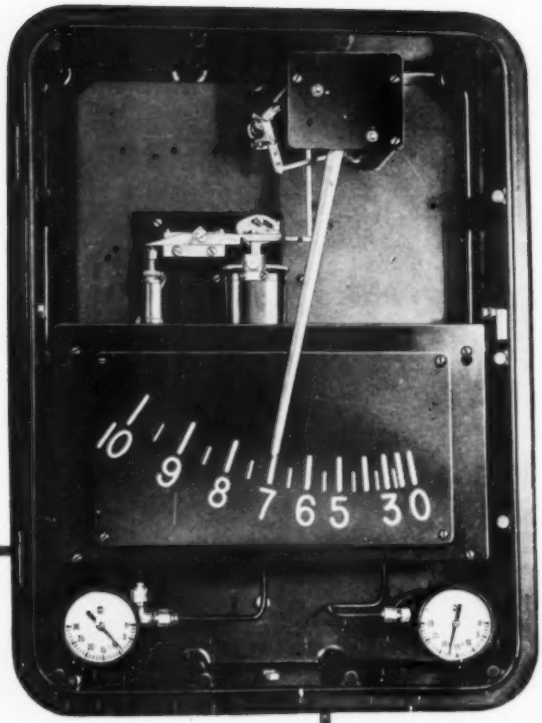
Full of vigor . . . and rarin' to go! Put *LCP to work and watch ECONOMY IN ACTION! Pumping . . . Pipelining . . . Refining . . . You name it! Regardless of time, place, or specific job . . . you pay for only the power you use. And it's available WHEN AND WHERE YOU NEED IT! COSTS LESS TO INSTALL . . . LESS TO OPERATE. And with *LCP on the job . . . man-power is free for more directly productive duty. Get more facts from the POWER ENGINEER of your Electric Utility Company TODAY!

*Low Cost Power

Use Utility Electric Power!

PETROLEUM ELECTRIC POWER ASSOCIATION

Box 1498, Oklahoma City, Oklahoma



SERIES A-88

PNEUMATIC TRANSMITTER AND CONTROLLER

1. NO NEED TO BREAK TUBING CONNECTION for nozzle adjustment.

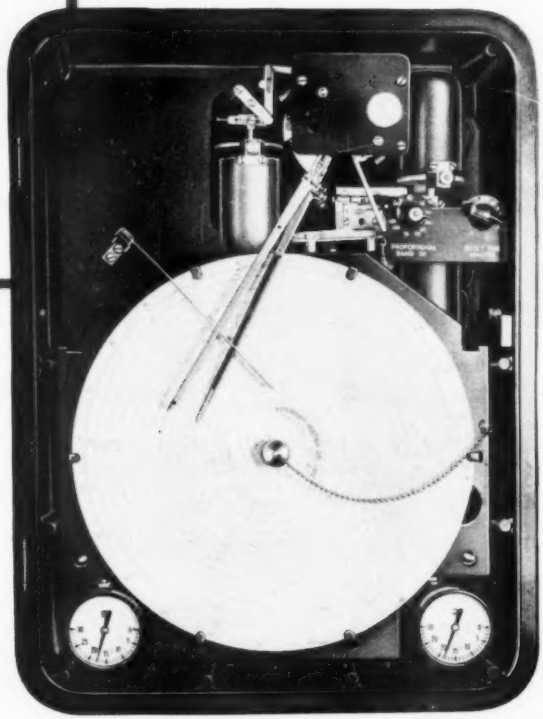
2. INSTRUMENT CAN BE REVERSED by shifting one link without disturbing other adjustments.

3. LINKAGE ALIGNMENT MADE EASY IN FIELD with positioning device.

4. MAXIMUM PROPORTIONAL BAND CHANGES with minimum output pressure changes.

5. EASY POSITIONING OF NOZZLE permits widening of proportional band without disconnecting tubing.

6. DAMPING DEVICE IN RELAY insures smooth operation. Primary orifice in relay is self-cleaning.



The eight outstanding features of the new American Meter Company Series A-88 pneumatic Transmitter and Controller point to just one all-important accomplishment—the solution to numerous servicing and maintenance problems in the control of flow, pressure, liquid level and specific gravity.

7. RESET VALVE IS SPRING-CLOSING and sealed with bellows. It is calibrated according to time.

8. LINEARITY ADJUSTMENT between transmitter and receiver.

ADDITIONAL POINTS DESCRIBED IN BULLETIN CT-49. The eight servicing and maintenance points listed cover only a few of the features technically described in the Bulletin pictured below.

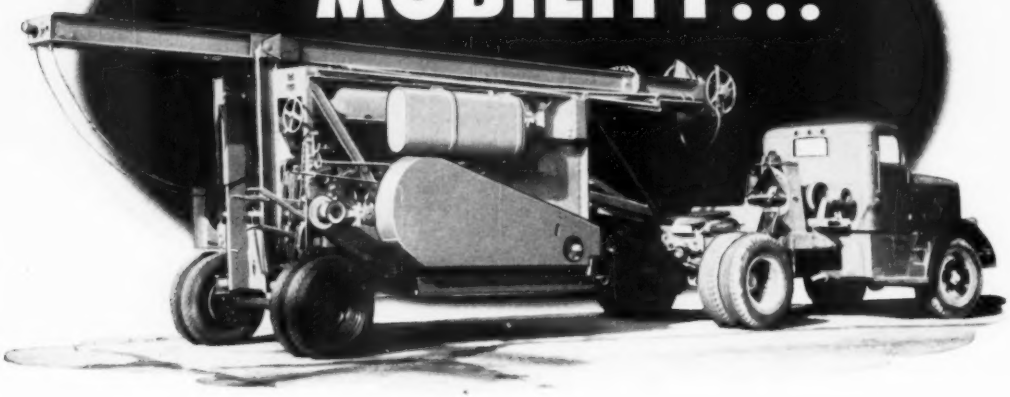
It will be of interest to Instrument men who wish to keep in touch with the latest developments in instruments control. Write for a copy.

AMERICAN METER COMPANY

INCORPORATED ESTABLISHED 1836

Albany • Alhambra • Atlanta • Baltimore • Birmingham • Boston • Chicago • Dallas
Denver • Erie • Fort Lauderdale • Houston • Joliet • Kansas City • Los Angeles • Minneapolis
Odessa • Philadelphia • Pittsburgh • San Francisco • Tulsa
In Canada—Canadian Meter Co., Ltd., Hamilton, Ont.

Time Saving
MOBILITY...



THE fast location-to-location moves that cut non-revenue loss of time are yours with Bucyrus-Erie spudders. Mobile semi-trailer or skid mountings make moving easy; cut big slices off costly down time and add it to profitable working time. With a dual pneumatic-tired semi-trailer unit you can transport drill and working tools in a single compact unit, can move smoothly over the road at normal highway speeds.

An easy-sliding skid mounting, designed for platform operation, is also offered. The smooth underside of the frame forms the skid base; permits easy moving of the complete unit on and off oil-country trucks, derrick platforms, or mud boats.

It will pay you to check up on the outstanding mobility of the entire line of Bucyrus-Erie spudders — 24-L, 28-L, 36-L, and 48-L. See for yourself how unprofitable moving time can be eliminated. Write today for information.

... One of many reasons why

BUCYRUS ERIE **Spudders are Hitting 'Pay' Across the U.S.A.!**

Four models to pick from

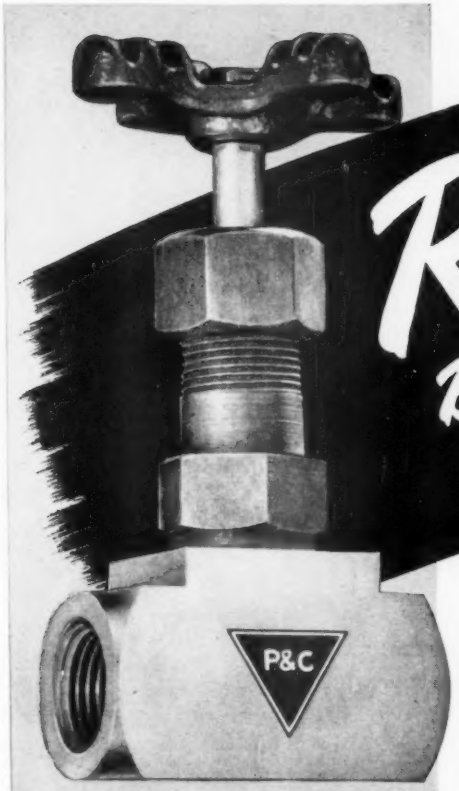
	Top to Bottom	Workover
48-L	6000 ft.	7000 ft.
36-L	3500 ft.	5000 ft.
28-L	2500 ft.	3500 ft.
24-L	1500 ft.	2500 ft.

60549

BUCYRUS-ERIE CO.

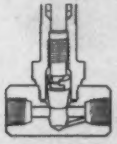
South Milwaukee
Wisconsin

DISTRIBUTORS IN ALL PRINCIPAL OIL FIELDS

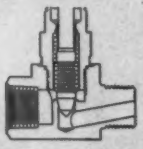


R-P&C BAR STOCK VALVES

RUGGED
ECONOMICAL
DEPENDABLE
VERSATILE

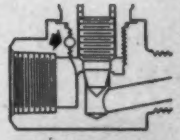


THRU-PORT—for handling heavy liquids which carry suspended solids or where precipitates or deposits cause trouble.

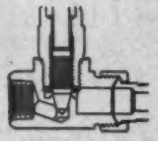


MALE and FEMALE END—Available in both Globe and Angle valves—useful for many special hook-ups.

(SOCKET WELDING ENDS NOT ILLUSTRATED)



LOCK BONNET—for lines carrying hazardous liquids or where there is extreme vibration.



UNION END—where frequent disassembly is required or to use instead of a break elsewhere in the line.

Following is a tabulation of working pressures of these valves:

MATERIAL	FIGURE NO. Globe	Angle	WORKING PRESSURE
BRONZE	1030	1031	500 lbs. at 150°F
CARBON STEEL	1040A	1041A	4000 lbs. at 150°F
			600 lbs. at 750°F
			550 lbs. at 900°F
			475 lbs. at 1000°F
12-14 CHROME STAINLESS STEEL	1050	1051	4000 lbs. at 150°F
COMBINATION	1060	1061	4000 lbs. at 150°F
12-14 CHROME			600 lbs. at 750°F
STAINLESS STEEL			550 lbs. at 900°F
CARBON STEEL			475 lbs. at 1000°F
18-8 STAIN. STEEL (TYPE 316)	1070A	1071A	4000 lbs. at 150°F
THRU PORT VALVES 1045A			1000 lbs. at 150°F
			600 lbs. at 750°F
			550 lbs. at 900°F
			475 lbs. at 1000°F

For more complete information, get in touch with your Reading-Pratt & Cady distributor or the District Office nearest you. Or, if you prefer, write direct to the factory at Reading, Pa.

ACCO

Reading, Pa. • Atlanta • Baltimore • Boston • Chicago • Denver • Detroit
Houston • New York • Philadelphia • Pittsburgh • San Francisco • Bridgeport, Conn.

R-P & C VALVE DIVISION
AMERICAN CHAIN & CABLE

TRADE MARK

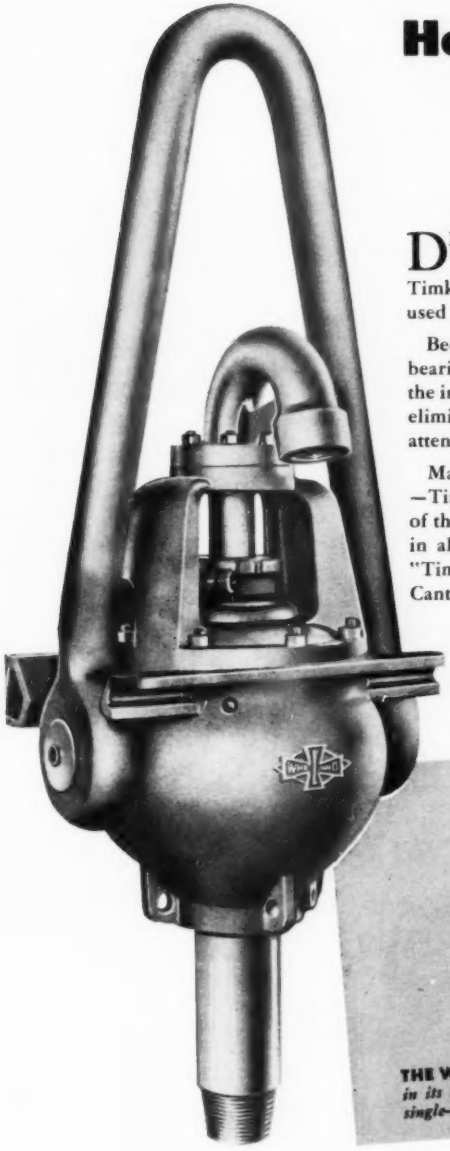
READING-PRATT & CADY VALVES

Wheatland

TUBE COMPANY

Bankers Securities Bldg. • Philadelphia 7, Penna.

How TIMKEN® bearings help a swivel do a good turn



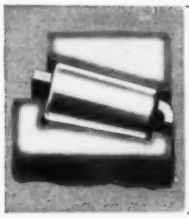
DRILLING CREWS find that they can keep drill pipe and bit turning more dependably when the swivel is equipped with Timken® tapered roller bearings. That's why Timken bearings are used in all swivels produced by The Wheland Company.

Because of the line contact between the rolls and races, Timken bearings give extra load-carrying capacity. True rolling motion and the incredibly smooth surface finish of the rolls and races practically eliminate friction and wear. And Timken bearings require less attention for lubrication—save time and lubricant.

Made of the best steel ever developed for tapered roller bearings—Timken fine alloy steel—Timken bearings normally last the life of the equipment in which they are used. Make sure you have them in all the equipment you build or buy. Look for the trade-mark "Timken" on the bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.

THE WHELAND COMPANY *uses this Timken Type T flat thrust bearing in its swivels at the main load position. Upward thrust is taken by a single-row Timken bearing at the top position.*



GREATER LOAD AREA

Because the load is carried on the *line* of contact between rollers and races, Timken bearings carry greater loads, hold shafts in line, wear longer.

The Timken Roller Bearing Company is the acknowledged leader in: 1. advanced design; 2. precision manufacturing; 3. rigid quality control; 4. special analysis steels.

TIMKEN

TRADE MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

TIMKEN 1899 50 1949 YEARS

NOT JUST A BALL ◯ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ◫ AND THRUST →◫← LOADS OR ANY COMBINATION ✳

Remote Control OF PLUG VALVES, TOO...

by LIMITORQUE

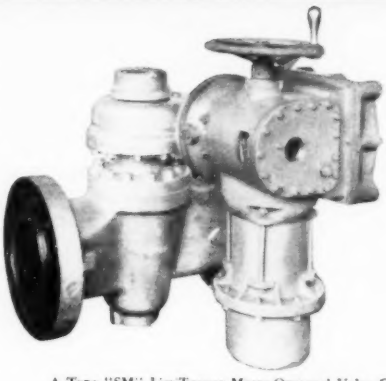
"PUSH-BUTTON" VALVE OPERATORS

A Type "SM" LimiTorque Motor-operated Valve Control operating a 24", 1000 lb. Nordstrom Plug Valve, through double reduction gear box.

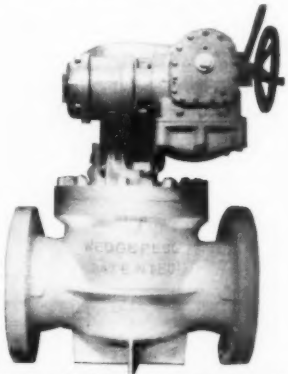
Plug Valves up to 30" diameter, 1000 p.s.i. differential pressure, operating day-in and day-out, for such well-known firms as Texas Pipe Line Co.; Shell Oil Co.; Pacific Gas & Electric Co., etc.

For remote or local control . . . positive, speedy, safe and dependable opening and closing of *Plug Valves*,—also Gate, Globe and Butterfly Valves,—and for automatically operating: doors, ventilators, damper controls, etc. LimiTorque utilizes any power source: electricity, oil, gas, water or air.

Be convinced, send for our 96 page "LimiTorque" Valve Catalog . . . it's a "veritable treatise" on *motorized valve operation*. Please use your Business Letterhead when requesting your copy.



A Type "SM" LimiTorque Motor-Operated Valve Control operating on 8" Walworth Plug Valve.



Type "SM" LimiTorque Valve Control operating 8", 600 lb. "Wedgeplug" Valve.

Philadelphia Gear Works, INC.

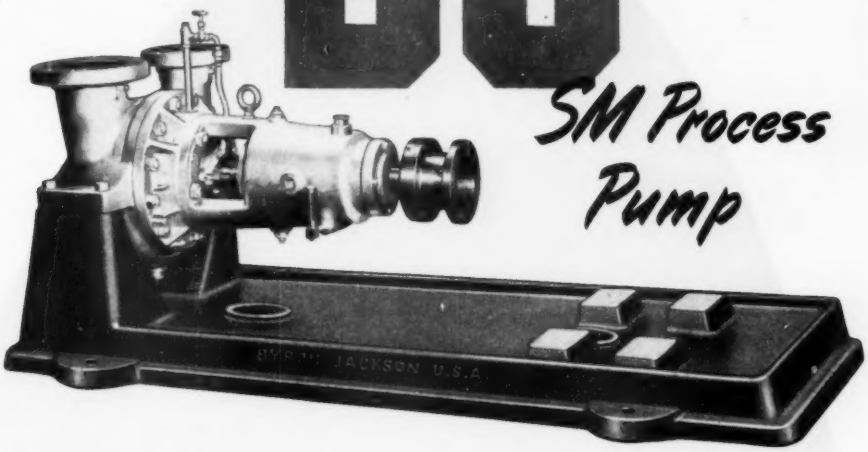
ERIE AVE. AND G ST., PHILADELPHIA 34, PA.

NEW YORK • PITTSBURGH • CHICAGO • HOUSTON

IN CANADA: WILLIAM AND J. G. GREEY LIMITED, TORONTO

Industrial Gears and Speed Reducers
LimiTorque Valve Controls

For *Hot* jobs BJ *SM Process Pump*

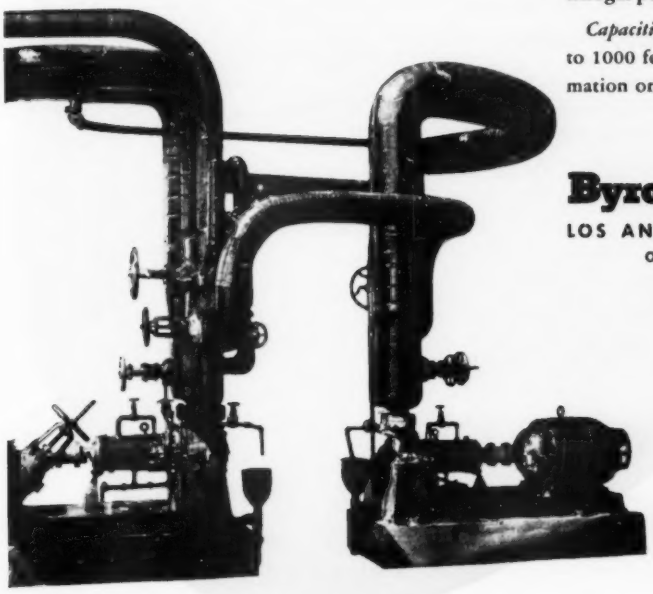


Hot, inflammable liquids...pumped under high pressures and at temperatures well above the flash point. Cold, boiling liquids . . . pumped from vacuum vessels. These and other pump problems are encountered in those industries whose products are processed in liquid form.

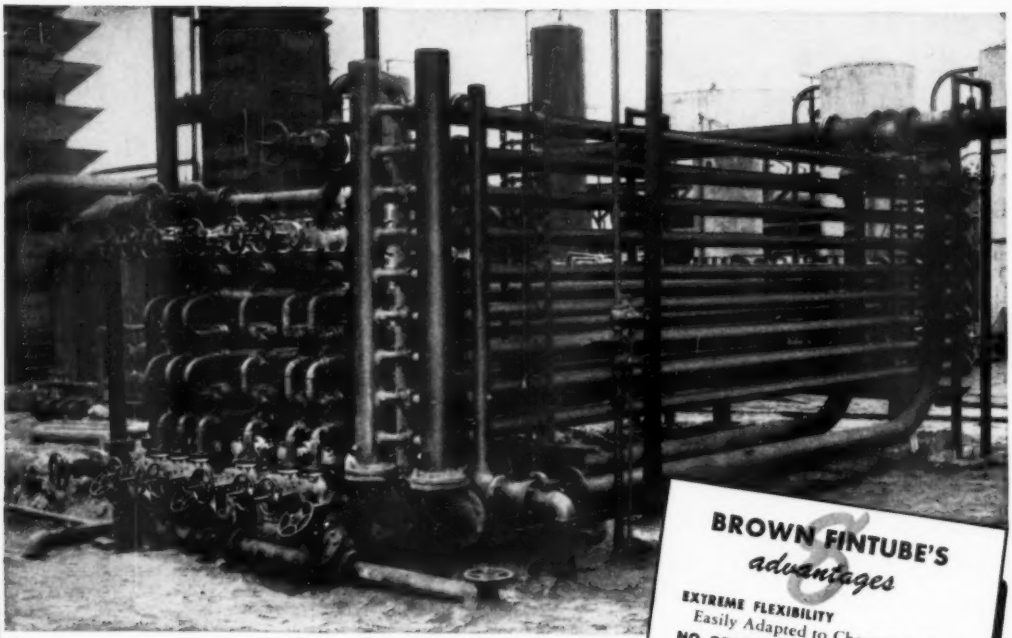
BJ Type SM Process Pumps are accepted as the safest and most efficient pumps used by processors for the "Hot" jobs. This is as it should be. For BJ is the leader in the development of centrifugal pumps for the process industries.

Capacities: 40 to 1200 gpm; Heads: 25 to 1000 feet. Write for the latest information on Refinery Pumps.

Byron Jackson Co.
LOS ANGELES 54, CALIFORNIA
Offices in Principal Cities



Two SM Process Pumps, installed by Refinery Engineering Co. Two-stage Turbine-driven pump (left) operates against a 775 foot head, motor driven pump (right) against a 530 foot head. Pumping 28° API reduced crude at 550° F.



BROWN FINTUBE'S *advantages*

EXTREME FLEXIBILITY
Easily Adapted to Changes in Duty
NO OBSOLESCENCE
Avoiding Waste and Expense
FLANGED HEAD END ASSEMBLY
Eliminating Ground Joint Seals
EASY MAINTENANCE
Using Only Common Tools
CONTINUOUS OPERATION
No Shut-Downs For Cleaning
REDUCED STORES REQUIREMENT
Minimizing Investment and Handling
QUICK DELIVERY
Only a Few Hours in Emergency
INCREASED CORROSION ALLOWANCE
Longer Tube Life

continuous operation

Brown Fintube Sectional Exchangers Eliminate Shut-downs for Cleaning Pay Users Extra Dividends

● By simply manifolding an extra parallel stream into the bank, one stream after another can be taken off-line and cleaned, while the exchanger operates at full capacity.

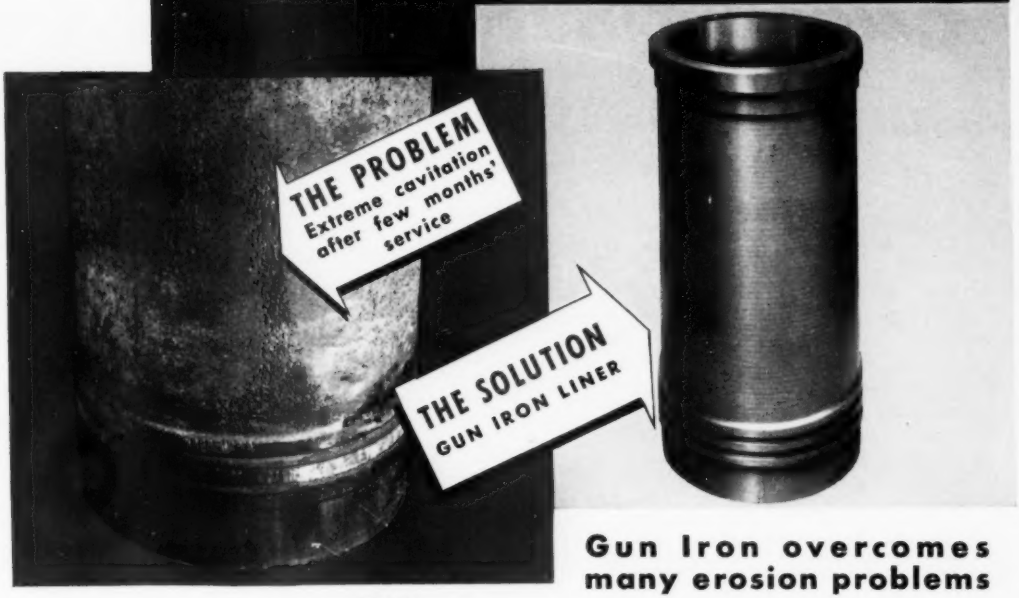
This avoids the necessity of carrying a 100% standby unit to insure continuous operation. It permits the sections to be cleaned as frequently as the duty requires, without effecting other parts of the plant, and assures *clean surfaces* and *efficient* operation, year after year, without shut-down.

For the utmost in efficiency and economy — use Brown's proven, welded fintube heat exchangers throughout your plant. Estimates and quotations furnished promptly. *Write for Bulletin No. 481.*

THE BROWN FINTUBE CO.
ELYRIA, OHIO

SECTIONAL HAIRPIN HEAT EXCHANGERS

GUN IRON for wearing-parts:



Gun Iron overcomes many erosion problems

WHEN subjected to erosion, ordinary cast iron parts often present a serious service problem. The photograph at the left above illustrates what coolant water can do to a marine diesel cylinder liner after a few months' service. In some cases these liners are cavitated to the point of being useless long before they would have to be replaced because of cylinder wear.

Cast Gun Iron cylinder liners have practically eliminated these problems wherever they have been tried. The dense, close-grained physical structure of Gun Iron is ideally suited to resist erosion and cavitation.

Gun Iron is also widely used for its resistance to frictional wear, pressure, impact and high heats in the railroad, petroleum and metal-working fields. In addition to superior physical properties, Gun Iron castings have uniform quality. This is possible because we carefully produce Gun Iron and its alloys in our own air furnaces, cast it and can machine the castings into precision parts, if desired.

If you use cast parts in your product, it will pay you to investigate Gun Iron's unusual physical properties as well as Hunt-Spiller's unusual facilities for producing them. Our engineers stand ready to discuss your problems with you.

What is
GUN IRON?

You'll find all the answers as well as valuable information on other metals and alloys in this interesting metallurgical bulletin. Write for it on your company letterhead. No obligation, of course.

HUNT-SPILLER GUN IRON • AIR FURNACE PROCESS •

HUNT • SPILLER
MANUFACTURING CORPORATION
393 DORCHESTER AVENUE • SOUTH BOSTON 27, MASS.
Canadian Representatives: Joseph Robb & Co., Ltd., 4050 Namur St., Montreal 16, P. Q.

Ears THAT LISTEN FOR ENGINE TROUBLE ...SAVE YOU COSTLY *"Headaches"*

These dependable controls are always on the job—even when you can't be. Alert to the slightest whisper of trouble, they can save you engine "headaches", help prevent expensive shutdowns, damage or repairs.

Just see how they help you: The No. 530 Sylphon engine safety control gives positive protection against overheating; it sounds an alarm—or stops the engine—at any time the cooling water temperature goes above, or the lube oil pressure goes below safe limits.

The 923-3WB Sylphon Temperature Regulator is equipped with a 3-way valve which is automatically positioned to direct all or part of the water through a by-pass. It maintains constant volume of water through pump and engine . . . gives quick "warm-up". . . improves performance.

These Fulton Sylphon controls are equally effective with diesel, gas or other internal combustion engines. Like all Sylphon controls, they're rugged and reliable...built to serve you long and well.

Bulletin YO-817 gives you complete details. Send for it today.

No. 923-3WB Sylphon Temperature Regulator. (Provided with crank and gear for manual operation when desired.)

No. 530 Sylphon engine safety control.

"Everything's under control"

FIRST WITH BELLOWS

Temperature Controls • Bellows Devices • Bellows Assemblies

FULTON SYLPHON
DIVISION

ROBERTSHAW-FULTON CONTROLS CO. KNOXVILLE 4, TENN.

Canadian Representatives, Darling Brothers, Montreal

...here's MY warehouse in CANADA"

Store—EDMONTON, ALBERTA
Sales Office—CALGARY, ALBERTA

The Edmonton store began operations on September 1, 1949, with but a single purpose: to lighten the supply load for those rugged pioneers who are doing so much to develop Canada's oil industry.

Because this is a pioneering operation, we have called upon our years of experience in other major oil field developments to assure a store stock of the best and most reliable equipment the market affords. Store personnel has been carefully selected also for experience, resourcefulness and enthusiasm. You will notice how smoothly and efficiently this combination works when you place your first order. We hope we shall have an opportunity to serve you — soon.

IN CHARGE of Jones & Laughlin Supply Company's Canadian operations is Mr. H. L. Wilkins, who has had more than thirty years experience in filling the supply needs of oil men. Although his headquarters will be at our District Sales Office in Calgary, Mr. Wilkins will spend a portion of his time traveling. Get acquainted with him when he visits your operations. Let him help you work out your supply problems.

JONES & LAUGHLIN SUPPLY COMPANY

Subsidiary of Jones & Laughlin Steel Corporation

TULSA, OKLAHOMA

"...here's MY warehouse!"

J&L STE

Power plus Economy!

Wherever Diesels run, Koppers American Hammered Piston Rings are the first choice. The reasons are crystal clear, as both builders and operators will tell you!

No loss in power—utter dependability—fewer overhauls—and lower fuel and oil consumption!

A miracle in metallurgy is behind these records; the combination of Porous Chrome* and K-Spun Metal has made Koppers American Hammered Rings *the* stand-out on all counts.

If you have a design or maintenance problem, you are invited to consult with our engineering department. Their ability in giving more progress to Diesel power is at your service. Koppers Company, Inc., Piston Ring Department, Box 626, Baltimore 3, Maryland.

*Van Der Horst Process

What Porous Chrome Plating and K-Spun Metal mean to you

1. Guaranteed against ring breakage. Tensile strength double ordinary gray iron castings.
2. All rings seat immediately without scuffing and scoring.
3. Ring and cylinder wear greatly reduced.
4. Fifty percent more elasticity retains shape and tension far longer.
5. Four times greater impact strength means long life in severe service.

IN EVERY SIZE, OF EVERY TYPE, FOR EVERY PURPOSE

KOPPERS

American Hammered

KOPPERS PISTON RINGS

perspective

Perspective in plant design and engineering calls for matching progressive engineering with economic foresight. We cannot predict the future, but we can recognize that the economic balance for a plant or process never stays put. We in Lummus do our best to look at your plans from past, present and future points of view.

Our perspective has paid off in plants of exceptional operating flexibility—able to make a profit in spite of wide swings in demand.

LUMMUS designs and builds with **PERSPECTIVE**

- economy
- fulfillment
- resourcefulness
- teamwork
- technique

perspective

In planning this French refinery, both its initial operating level and its ultimate, expanded capacity were guiding factors for design. Room was provided for the easy addition of filters, double pipe chillers and refrigeration equipment, to double the capacity of the unit in this respect. An efficient plant today, it will be equally efficient tomorrow, because expansion need never be "makeshift."

perspective

Lummus catalytic cracking plants, war-built for 100-octane gasoline, are being operated to produce motor gasoline of lower octane rating on a consistent low-cost basis. Their suitability for this latter service was attained without any compromise in design for their original purpose. Rather, the Lummus-engineered design had the flexibility to meet requirements for the efficient production of either fuel.

perspective

The interest of Lummus in any of its installations does not end with construction and initial operation for customer acceptance. Periodic visits by Lummus field representatives are continued to review performance. In a recent case where a radical change in product requirements arose, these operating checkups furnished valuable aid in arriving at a prompt and practical plant modification to meet the new demands.

THE LUMMUS COMPANY
420 Lexington Avenue, New York 17, N. Y.

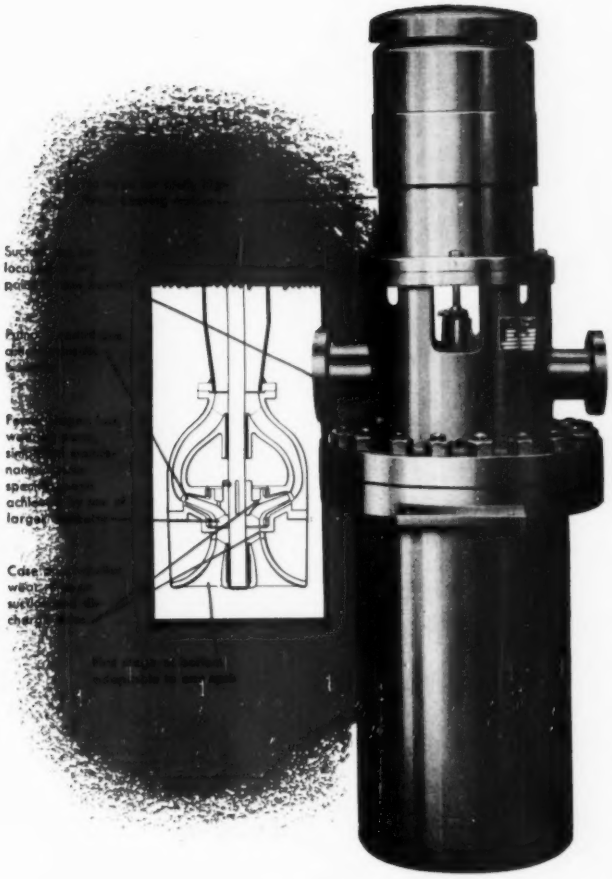
LUMMUS

CHICAGO—600 South Michigan Avenue, Chicago 5, Ill.
HOUSTON—Mellie Esperson Bldg., Houston 2, Texas

The Lummus Company, Ltd., 525 Oxford St., London, W-1, England

Société Française des Techniques Lummus
39 Rue Cambon, Paris 1er, France

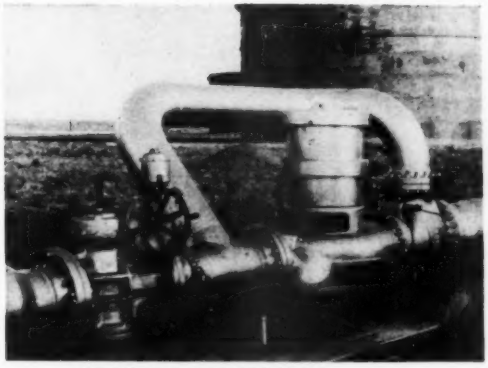
Compañía Anónima Venezolana Lummus—Edificio "Las Gradillas"
Esquina Las Gradillas, Caracas, Venezuela



CUT *Cost Losses*

with United's new VCD Vertical high-volume moderate-head pump!

Specifically engineered to meet critical NPSH requirements, the VCD offers space-saving advantages of vertical design at low initial cost and reduced maintenance costs. Without limitation of previous deep-well designs, increased impeller diameter handles greater volume at required head with fewer stages, fewer wearing parts, simplified servicing. Radial and axial balance eliminate need for costly high-thrust-bearing motors. Longer, smoother uninterrupted service is assured. Like all United Pumps, type VCD can be engineered and built to your specific requirements. Available to any npsh, 50 to 10,000 gpm. Contact your nearest United office or write today for details.



TYPE IL FOR NORMAL NPSH

As easy to install as a valve in the line, this United type IL pump offers high efficiency and compact design at low cost. Single stage, capacities to 7,500 gpm, ideal where npsh is not too critical.

UNITED CENTRIFUGAL PUMPS

Division of United Iron Works
Since 1880

Main Offices and Plants · **OAKLAND, CALIFORNIA**

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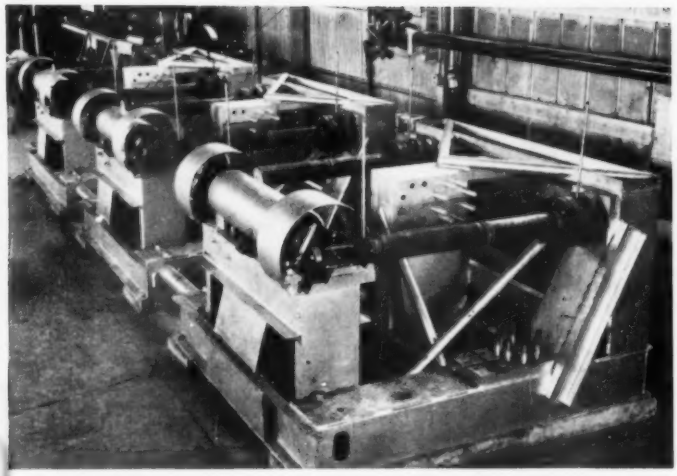


Strength through Design in Tube-Turn welding flanges

Taking the measure of piping fatigue

PIPE lines are *live, dynamic* members of a piping system. They *breathe* with changes in temperature and pressure. And the danger of fatigue failure from pressure shock, thermal shock, and cyclic conditions is ever-present.

More precise information was needed on this subject. So, Tube Turns research engineers set out to get the answers. For the purpose, they designed and built a unique cyclic testing machine to handle full-size piping assemblies under a wide range of temperature, pressure, and corrosive conditions. And on this torture rack they subjected flanged assemblies to reverse bending tests carried on to ultimate failure. Information revealed forms the basis of new designs for greater strength in Tube-Turn welding flanges.

Other piping assemblies, too—welding elbows, mitre bends, manufactured and fabricated tees, pipe bends—have been subjected to punishment more severe than any they would probably face in normal service.

And this perpetual search for greater strength through better design has paid off in the form of realistic, non-theoretical facts providing a sound basis for Tube Turns' manufacturing policies—facts important to anyone interested in getting his money's worth in long life from piping installations.

Tube Turns' research and development organization, finest in the welding fittings industry, is constantly striving for the improvement of present products, the development of new ones. Notable among their recent achievements have been the design of a new type welding tee and the development of aluminum welding flanges.

Ask to be put on the mailing list for Tube Turns' technical periodical, *Piping Engineering*. Paper 6.01, for instance, deals extensively with standard steel flanges. Others give you research findings and additional working information pertaining to piping not generally available in convenient form.

TUBE-TURN

tt

WELDING FITTINGS AND FLANGES

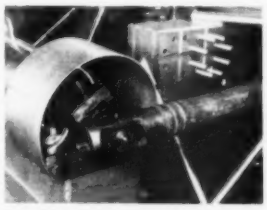
TUBE TURNS, INC.

240 East Broadway, Dept. L, Louisville 1, Kentucky

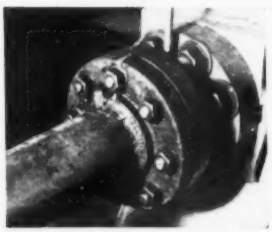
District Offices at New York, Philadelphia, Pittsburgh, Chicago, Houston, Tulsa, San Francisco, Los Angeles

TYPICAL FLANGE ASSEMBLY TESTS

Assemblies were of 4-inch nominal size with 300 pound forged steel flanges and standard weight pipe.



Eccentric crank arm produces up-and-down movement which creates a cyclic bending moment on flange or fitting at opposite end of assembly.



Water spurts from crack in test specimen. Almost invariably, failure occurred in the pipe adjacent to the flange.

Aluminum welding flanges . . . another Tube Turns first! Available in a wide range of types and sizes.

SYMBOL OF ASSURANCE

J.F. Pritchard & Co.

ENGINEERS • CONSTRUCTORS • MANUFACTURERS

for the CHEMICAL, PETROLEUM, GAS & POWER industries

908 Grand Ave. • Kansas City, Missouri

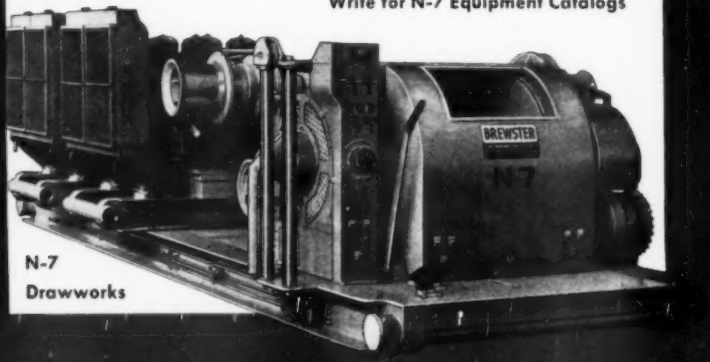
Offices in Principal Cities from Coast to Coast

3 GREAT DRILLING TEAMS

BREWSTER N-7 TEAM

For 7500' DRILLING

Write for N-7 Equipment Catalogs



N-7 Drawworks

N-7 MATCHED EQUIPMENT

BREWSTER N-3 TEAM

For 3500' DRILLING

WRITE FOR N-3 EQUIPMENT CATALOGS

N-3 Drawworks

N-3 MATCHED EQUIPMENT

Brewster Equipment is Sold By

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BOYAIRD SUPPLY CO.
INDUSTRIAL SUPPLY CO.
MURRAY BROOKS, INC.
STEAMS SUPPLY CO.

In Canada:
HALEY SUPPLY CO.

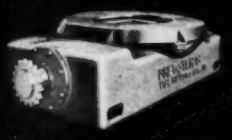
BY BREWSTER

BREWSTER N-4 TEAM

For 5000' DRILLING

Write for Catalogs of N-4 Team Equipment

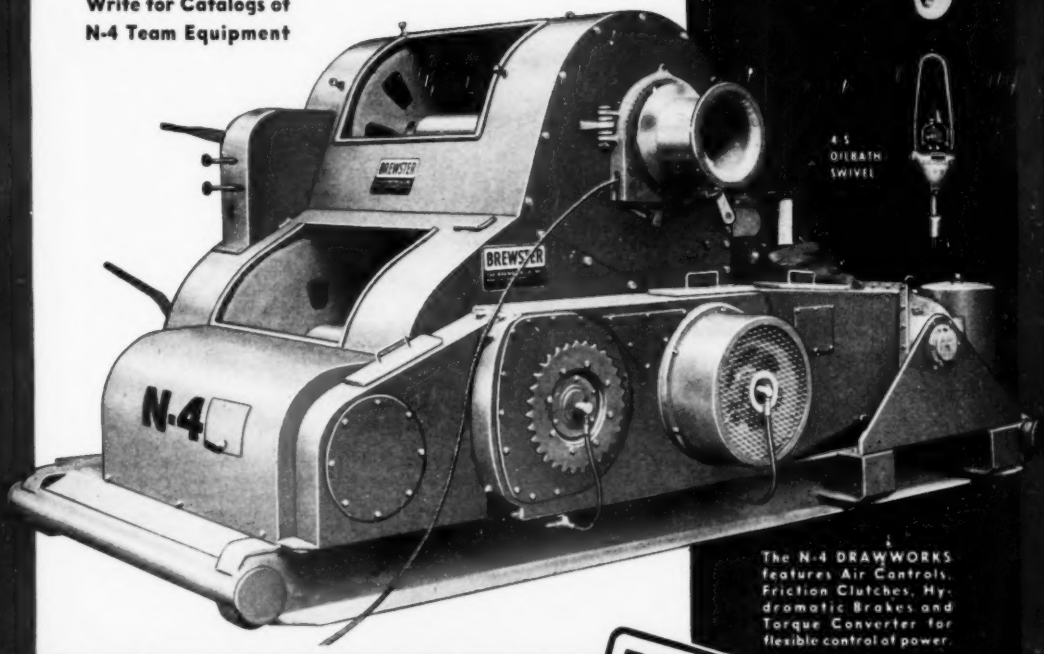
N-4 MATCHED EQUIPMENT



RS-18 OILBATH ROTARY

H-100 HOOK BLOCK

4-S OILBATH SWIVEL



The N-4 DRAWWORKS features Air Controls, Friction Clutches, Hydromatic Brakes and Torque Converter for flexible control of power.

The BREWSTER CO., Inc.

Manufacturers of Drilling Equipment Since 1910

SHREVEPORT, LOUISIANA, U.S.A.

BREWSTER *Drilling Equipment*

OHIO FUEL GAS CO. Hundreds of OIC Valves are installed at the Ohio Fuel Gas Company's 70-tank Mt. Sterling Compressor Station, about 20 miles southwest of Columbus, Ohio.

FOR PROPANE GAS SERVICE . . .

PUBLIC utilities which supply propane gas to supplement natural gas at times of peak demand, as well as the companies which rely on propane gas to save valuable production time, praise the stop watch accuracy of OIC Valves. Suppliers or users — they're finding that OIC Valves give steady, economical service on *all* propane gas installations.

One of the many utilities in this vitally important field is the Ohio Fuel Gas Company, serving almost half a million customers in a geographical area approximately half the size of Ohio. OIC Valves are installed at both of the company's propane gas plants, with a combined daily capacity equivalent to 65 million cubic feet of natural gas. These plants with 110 tanks (each 30,000 gallons water capacity), are at the company's 70-tank Mt. Sterling Station and the company's 40-tank McMahon Compressor Station near Toledo, Ohio.

OR ANY SERVICE!

If you don't have OIC's pace-setting valves installed on your lines — *no matter what the service* — switch to OIC! You'll find the right valve with the right trim for your specific job, in OIC's complete, long line of valves. Discover for yourself such exclusive features as the patented gland and gland flange that makes repacking of the stuffing box easy . . . seat rings of the modern end seated type for smooth operation — positive seating and long life . . . the special condensation chamber that protects the packing in high-temperature service. Discover, like hundreds of other companies, that it pays to invest in the best in valves. That means OIC!

REPLACEMENT IS EASY WITH THE OIC VALVE CROSS REFERENCE CHART

Simply check the number of the valve on the line, and refer to this handy chart. It will tell you the correct OIC Valve needed to replace it. Write for your *free* copy to The Ohio Injector Company, Wadsworth, Ohio. 0-648-17

OIC VALVES

BRONZE • IRON • CAST STEEL • FORGED STEEL

COLUMBIAN STEEL TANK COMPANY
MANUFACTURERS
TANKS FOR THE WORLD
KANSAS CITY, MO. U.S.A.

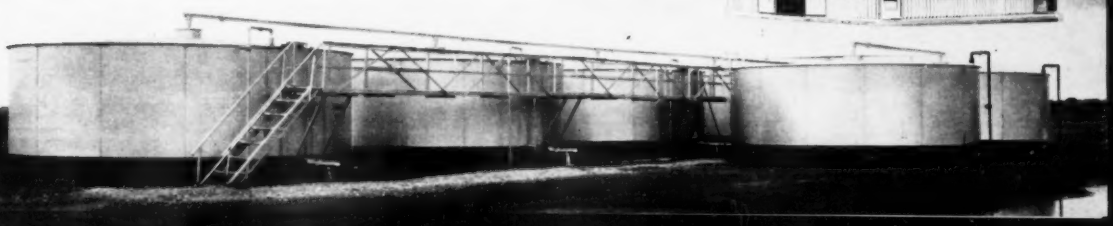
COLUMBIAN STEEL TANK CO.
K.C. MO.
COP-NIC
A COPPER-NICKEL ALLOY
TANKS FOR THE WORLD

COLUMBIAN
BOLTED STEEL TANKS

The Columbian Trade Mark is internationally known as a dependable guide to bolted steel tanks that give extra value in long-life, economical storage service in oil fields all over the world. Precision engineered from top quality steel, Columbian Tanks provide easy assembly. You'll like the many exclusive construction features. Columbian Bolted Steel Tanks are available now for oil producers. Columbian COP-NIC Tanks especially for sour crude, will be available when conditions permit.

★ Columbian All-Metal Buildings are ideal for warehouses, engine houses, garages, equipment and storage houses. Rigid, strong, fire-safe, low upkeep.

COLUMBIAN STEEL TANK CO.
P. O. Box 4226-H **Kansas City, Missouri**



Serving the Refinery Industry

YOUR KEY TO EFFICIENT OPERATION REGARDLESS OF PROCESS

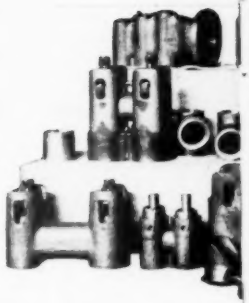
- Key Research
- Key Engineering
- Key Service (Before and After Purchase)

For temperatures up to 1100°—pressures up to 2000 lbs. An efficient, economical low and intermediate low pressure-temperature fitting.

For combination high pressures and high temperatures requiring mechanical joint, providing streamline flow and single tube removal.

For combination high pressures and high temperatures with rolled joints, providing streamline flow, single tube removal, and extended life with economical reconditioning.

For temperatures up to 1200°—pressures up to 2000 lbs. Offers uniform distribution of installation stresses. Provides low maintenance, longer life, lower cost, greater safety.



Engineers • Metallurgists • Machinists
Steel Founders • Fabricators

All Over the World . . .

Regardless of temperatures and pressures, whatever your process—Key engineers the right type of fitting for you.

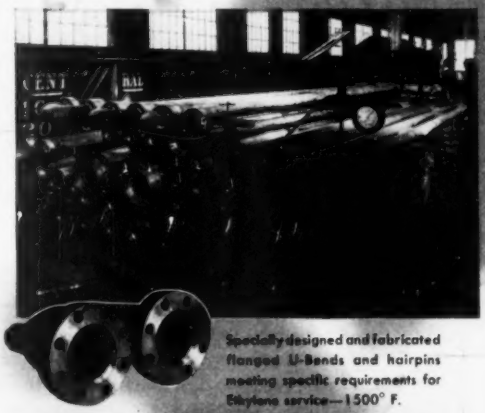
1. Key Fittings are the result of years of pioneering and field service.
2. Key Fittings are meticulously engineered and "tailor-made."
3. All materials are processed under the most accurate control—all parts manufactured with great precision and care and thoroughly inspected at each step.
4. All parts and assemblies conform to high quality specifications.
5. All fittings are hydrostatically tested.

After manufacturing and delivery — Key's work for you has just begun. Key "lives" with your fittings until retirement: Key offers supervision on installation — maintenance assistance — even reconditions fittings after years of service.

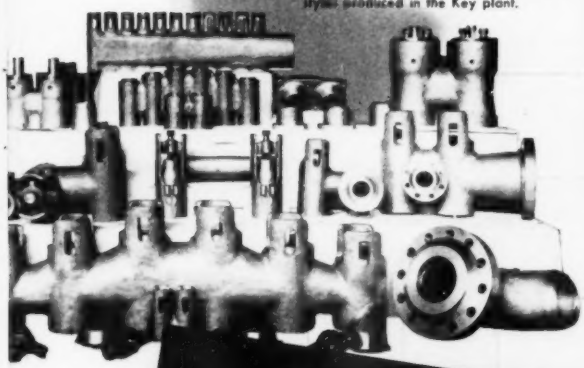
The result: Longer span-of-life for Key Fittings, minimum maintenance costs, less down time at shut-down periods, complete satisfaction in operation — wear — service — dollars and cents.

Write, Wire or Phone for Complete Details

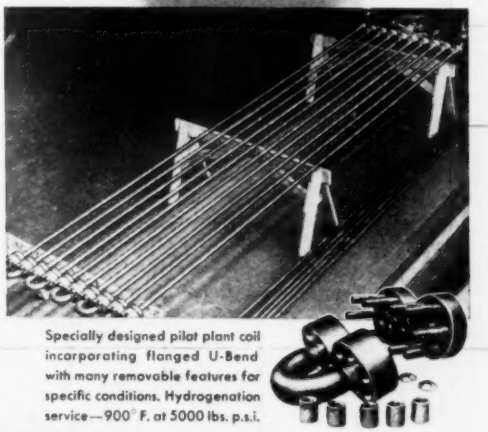
Specially designed coil with a steam jacket of completely fabricated construction incorporating many new features for hydrogenation service—900° F. at 10,000 lbs. p.s.i.



Specially designed and fabricated flanged U-Bends and hairpins meeting specific requirements for Ethylene service—1500° F.



Different types of oil refinery fittings typical of the intricate shapes, types and styles produced in the Key plant.



Specially designed pilot plant coil incorporating flanged U-Bend with many removable features for specific conditions. Hydrogenation service—900° F. at 5000 lbs. p.s.i.

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pH and Conductivity Control with the ElectroniK Potentiometer

THE pH and conductivity of the liquids and solutions you use in your plant are mighty important. You can control these conditions easily and automatically with the Brown ElectroniK . . . the instrument of unmatched speed and extreme accuracy . . . the instrument with the moving parts in vacuum tubes and its contact points in mercury switches.

You get control that not only reduces production costs but also improves quality and cuts down product rejects. In addition, it reduces maintenance and waste disposal costs. In all cases it writes a record of what has happened—a mighty handy proof of your plant practices.

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Catalog 15-12 describes the ElectroniK and its application to the control of pH and conductivity. Write for your copy today.

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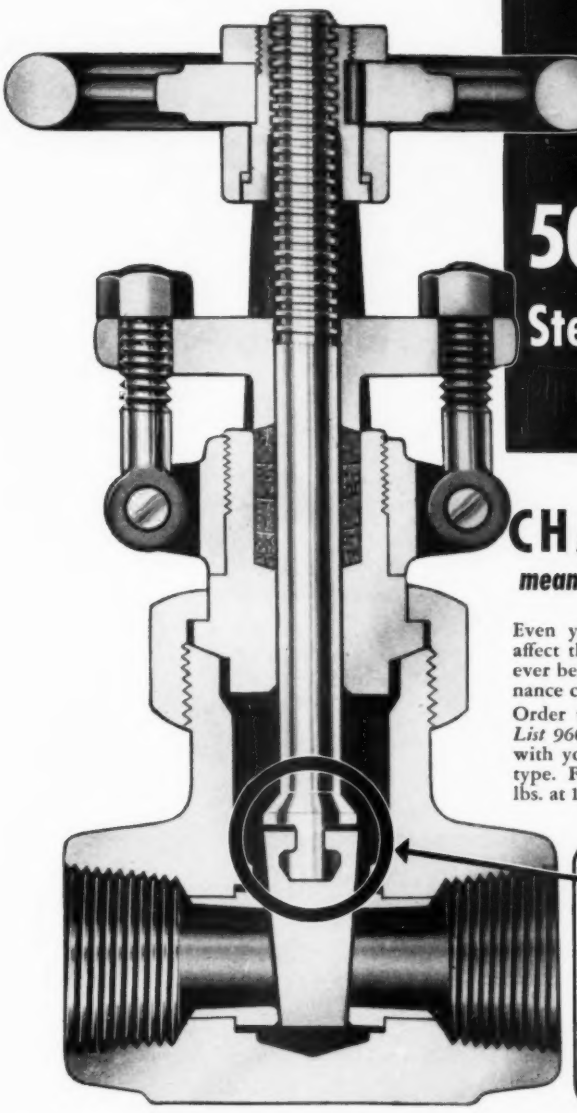
NEW DESIGN FEATURE!

50% STRONGER
Stem and Wedge Gate Connection

OF CHAPMAN LIST 960
means Lower Maintenance Costs for you

Even your most extreme operating conditions won't affect this newly designed List 960. It's tougher than ever before. Built to dramatically reduce your maintenance costs.

Order today so you can *check this extra-toughness of the List 960 for yourself.* Available ¼" to 2"... rising stem with yoke (as illustrated). Or rising stem inside screw type. For pressure range 2000 lbs. at 100 deg. F., 380 lbs. at 1000 deg. F. Specify List 990 for higher pressures.



NEW DESIGN...compensates at points where excessive strain can develop... gives 50% stronger stem and wedge gate connection

PLUS... extra wear resistance from heat-treated seat rings and wedge faces hardened to 800 Brinell by *exclusive* Malcomizing Process

The Chapman Valve Mfg. Co., Indian Orchard, Massachusetts

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SERIES 12100*

FORGED STEEL

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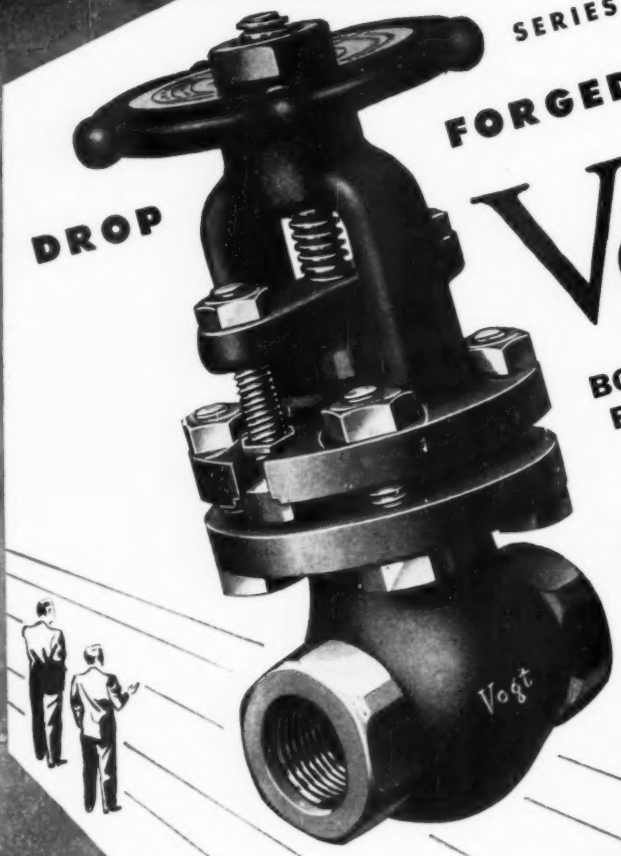
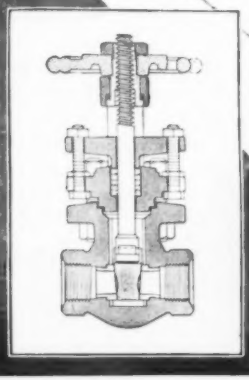
BOLTED BONNET
BOLTED GLAND

150-800 POUND

GATE VALVES

SIZES 1/4" to 2"





***Series 12100**

CARBON STEEL } 800 Pounds @ 750°F.
1500 Pounds Cold Non-Shock

For 150-800 pounds service • Round Bolted Bonnet • Bolted Gland • Gasket or Ground Joint • Outside Screw and Yoke • Renewable Seat Rings • Solid Wedge — Slotted Type • Rising Stem 11½-13% Chrome Stainless Steel Trimmings • Sizes 1/4" to 2" inclusive.

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Export Division: 30 Rockefeller Plaza, New York, N. Y.
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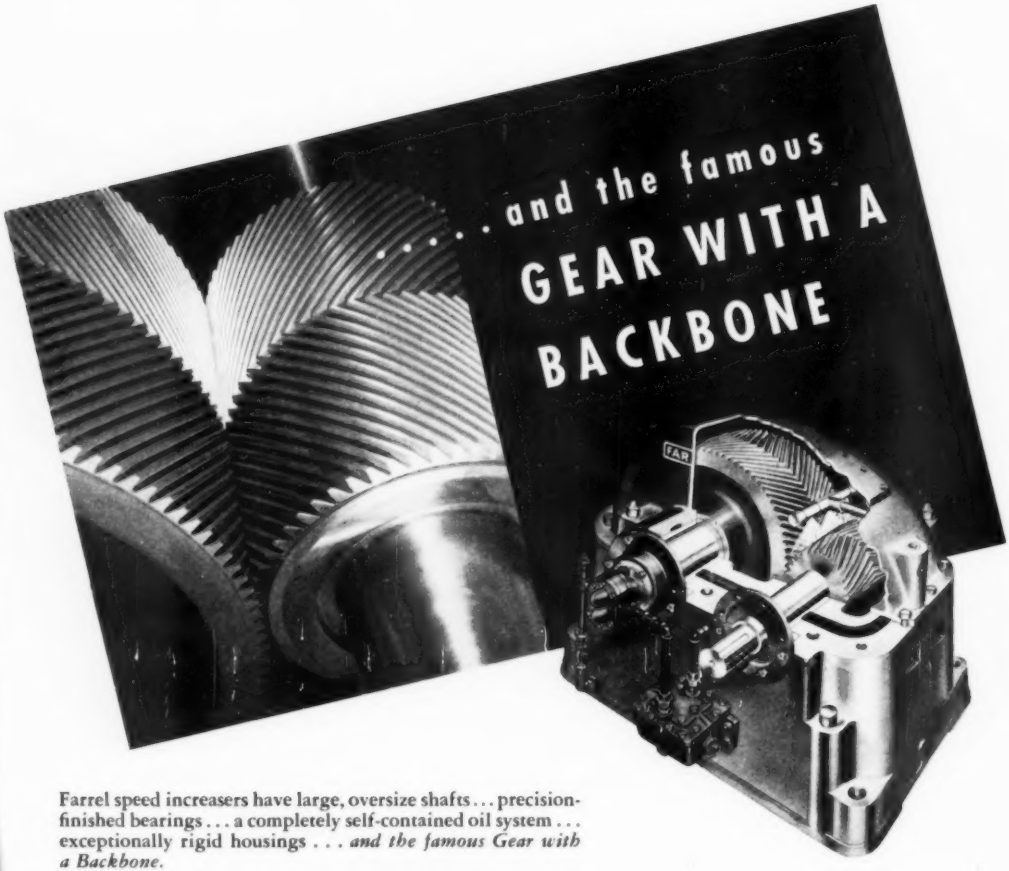
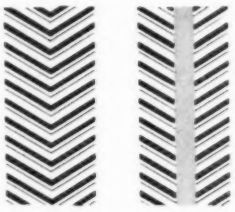


Farrel speed increasers have large, oversize shafts . . . precision-finished bearings . . . a completely self-contained oil system . . . exceptionally rigid housings . . . *and the famous Gear with a Backbone.*

These gears are the continuous tooth herringbone design, precision generated by the Farrel-Sykes process. Because there is no useless center groove separating the two helices, the entire face width of the gear is put to work, providing extra strength and higher load-carrying capacity in smaller space. This is a definite advantage where continuous, trouble-free service is a "must."

Farrel speed increasers are made in 49 standard sizes with speed ratios ranging from 1:1 to 12:1. For higher ratios, units using two sets of gears are supplied with ratio range from 12:1 to 40:1.

For full information about the speed increaser with the famous *Gear with a Backbone*, write for a FREE copy of Bulletin No. 448.



This comparison shows the greater tooth area of the *Gear with a Backbone* (left) which gives it increased load-carrying capacity over the conventional gear with center groove (right).

FARREL-BIRMINGHAM COMPANY, INC., 344 VULCAN ST., BUFFALO 7, N. Y.

Plants: Ansonia and Derby, Conn., Buffalo, N. Y. *Sales Offices:* Ansonia, Buffalo, New York, Boston, Pittsburgh, Akron, Cleveland, Detroit, Chicago, Los Angeles

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FB-546

INSURE MAXIMUM REFINERY PERFORMANCE

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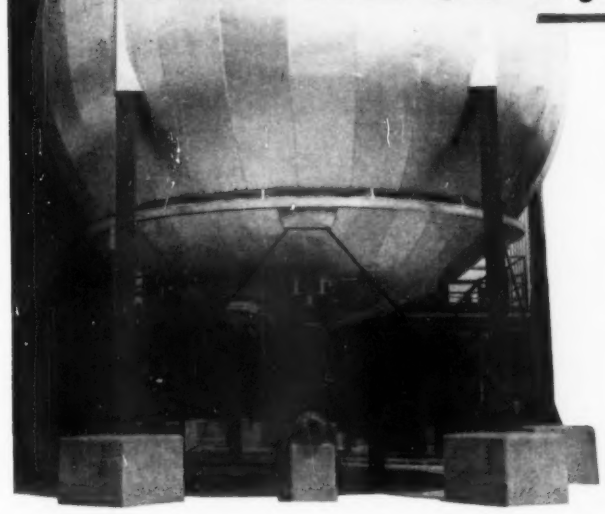
no salt plugging, less HCL corrosion
full use of maximum refining capacity

with PETRECO *High Efficiency Desalting*



PETRECO Electric DESALTERS assure maximum salt removal, because they are kept at top efficiency through PETRECO SERVICE, which also provides

PROVED ENGINEERING DESIGN • CONTINUING PROCESS IMPROVEMENT RESEARCH • REGULAR EFFICIENCY CHECKS • THOROUGH EQUIPMENT INSPECTIONS • API-ASME CODE EQUIPMENT • TRAINED AND EXPERIENCED PERSONNEL • LABORATORY TESTING COOPERATION • COMPLETE REPLACEMENT PART STOCKS • EMERGENCY REPAIR SERVICE ON 24 HOUR CALL

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SPECIALIZED *Electric* PETROLEUM PROCESSES { DESALTING / DEHYDRATING

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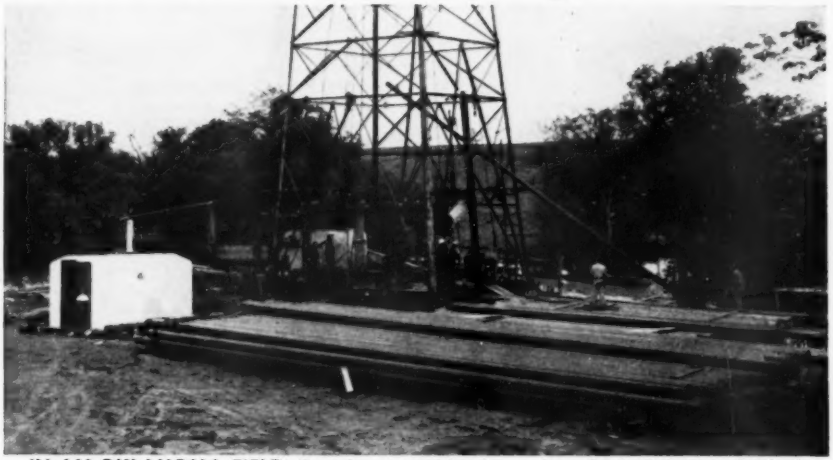
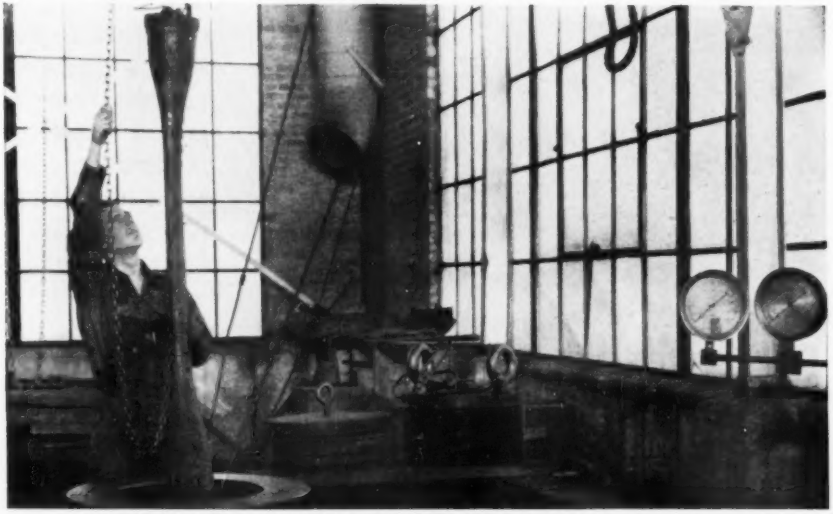
DEPENDABILITY THROUGH



IN AN OKLAHOMA FIELD: Running a combination string of 7-inch S-40 and 7-inch S-80 A.O. Smith Casing.

RESEARCH AND ENGINEERING



IN THE A.O. SMITH RESEARCH LABORATORY: Special collapse-testing apparatus for casing.

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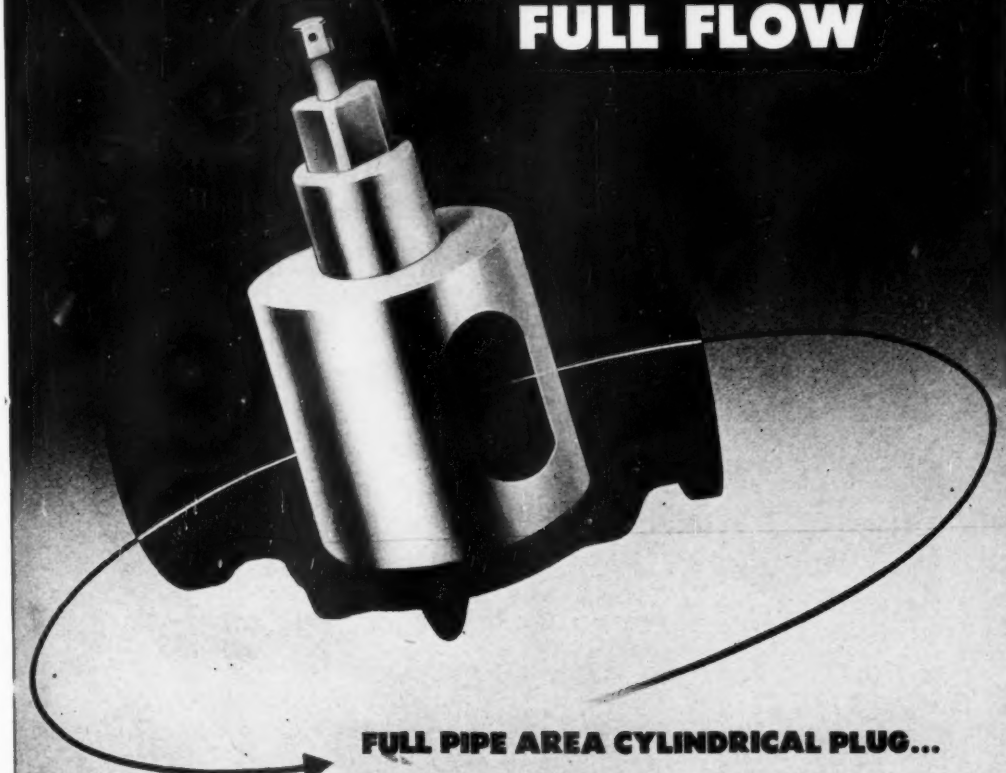
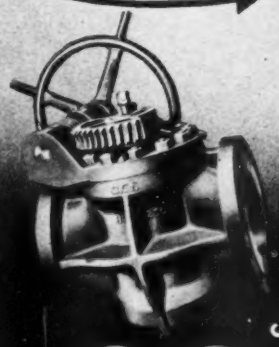


FULL PIPE AREA CYLINDRICAL PLUG...

Stands alone in its ability to minimize turbulence and change of velocity, without use of larger-than-pipe-size valves. Quick operation, if needed, no wedging, lubricated for long life and corrosion protection...why anything but an A.C.F. Lubricated Plug Valve.



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a.c.f. FULL PIPE AREA PLUG VALVES

LUBRICATED

Representatives in more than 50 Principal Cities.

A.C.F. Valves are available in many types and sizes. Ask for catalog 4-OG. American Car and Foundry Company, 30 Church St., New York 8, N. Y.

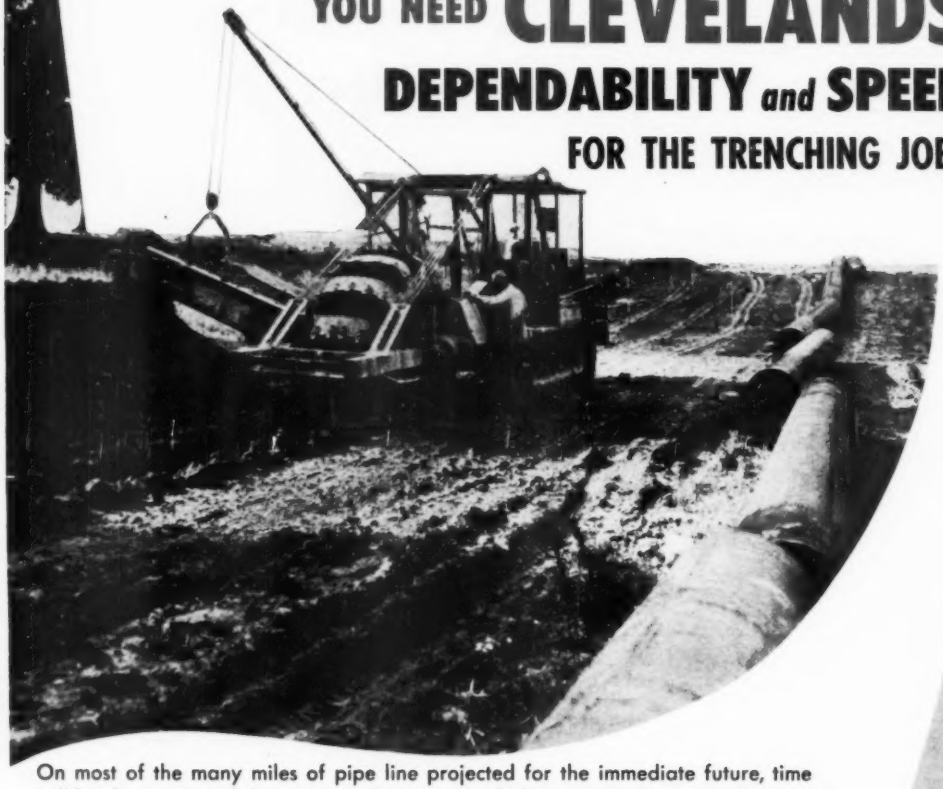
Working Against Time

ON YOUR OIL FIELD PROJECT?

YOU NEED CLEVELANDS

DEPENDABILITY *and* SPEED

FOR THE TRENCHING JOBS



On most of the many miles of pipe line projected for the immediate future, time will be the essence of the contract. One way in which you can rely on meeting and beating your schedules is to have CLEVELANDS "Up Front" on the trenching jobs where the pace is set for the following crews and where the profit begins. Thousands of miles of completed trench on all types of work—long and short lines, tough and normal—prove the value of such CLEVELAND characteristics as: Correct wheel-type full-crawler design—Rugged all-welded unit-type construction—A multiplicity of transmission-controlled speed combinations—Hairline maneuverability and perfect balance on specially designed wide crawlers—Ample power, directly applied without waste or loss—Unimpaired visibility with all controls within instant reach of operator. Be sure to see your local CLEVELAND distributor and let him give you Details and Specifications and help you select the CLEVELAND model best suited to your work.

THE CLEVELAND TRENCHER CO.

20100 ST. CLAIR AVENUE • CLEVELAND 17, OHIO

Announcing New GOULDS Stainless Steel Pumps...

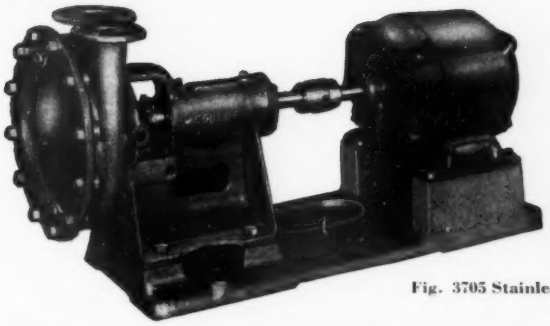


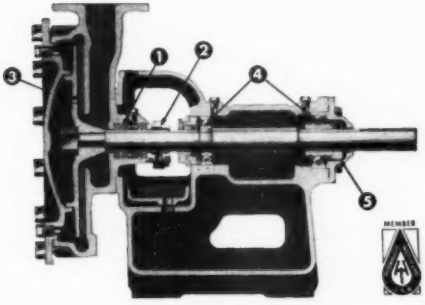
Fig. 3705 Stainless Steel Centrifugal

For outstanding service in handling corrosive liquids —*Goulds Stainless Steel Centrifugals*

Goulds Fig. 3705 Stainless Steel Centrifugals represent the last word in advanced pump design. They will give efficient, dependable service in handling corrosive liquids—at low cost.

CAPACITIES Made in 8 sizes to handle up to 750 G. P. M. with heads to 180 ft. depending on capacity.

Outstanding Economy in Design and Performance



CHECK THESE FEATURES

1. Stuffing box under suction pressure only—This assures long packing life and freedom from excessive leakage.
2. Cowl type stuffing box gland split on 45° angle—Easy to disassemble. Single and double mechanical seals also available.
3. Piping connections in casing—You can inspect or clean pump by removing case cover without disturbing connections. You may also remove impeller in the same way.
4. Bearings - Prelubricated and fully protected from liquids pumped.
5. Can be adjusted for wear—If wear eventually occurs between impeller vanes and casing, you can adjust clearance using outboard bearing locking collar.

For complete information on this advance design Stainless Steel Pump send coupon for FREE Bulletin.

Goulds PUMPS INC.
Seneca Falls New York

GOULDS PUMPS INC., Dept. OG, Seneca Falls, N. Y.
Please send your FREE Bulletin to:

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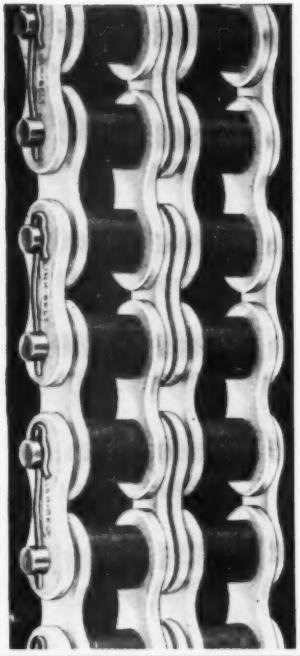

LINK-BELT PRODUCTS

are the STANDARD in the Oil Industry

For more than 70 years Link-Belt's products have faithfully served world-wide industry. For original equipment manufacture, as well as for replacement parts, the Link-Belt trademark has always been *the Standard* for those who drill for and produce oil. Some of our products are shown here . . . the complete line is fully described in your Composite Catalog.

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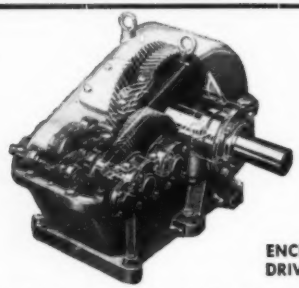
Offices, Factory Branch Stores, and Distributors in Principal Cities — Representatives throughout the World.

Precision Steel Roller Chain

Link-Belt Precision Steel Roller Chain is made in accordance with Manufacturers' (A.S.A.) Standards, in all required sizes and widths, including sprockets. Alloy steel construction, great strength, light weight and ability to withstand shock has made it the top chain choice of operators and manufacturers alike.

Link-Belt "RC" Flexible Coupling. Note how each wheel engages individual rollers. Plastic housings are also available.

Single and multiple cut tooth sprockets are made for all chain sizes in standard arm, rim and plate centers, in solid or split types.

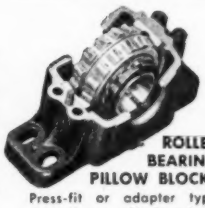


ENCLOSED DRIVES

The Link-Belt line includes: Herringbone and Worm Gear Drives, Gearmotors, Fluid Drives and P.I.V. Variable Speed Drives. They are available in a variety of sizes. Regardless of your specific needs for ratio, power or speed, we have the correct answer, and our engineers will be pleased to assist you with your Speed Reduction problems.

DE SERIES ROLLER BEARINGS

Radial thrust, self-contained, preadjusted roller bearings—wide range of bearing bores—press-fit or adapter type mounting.

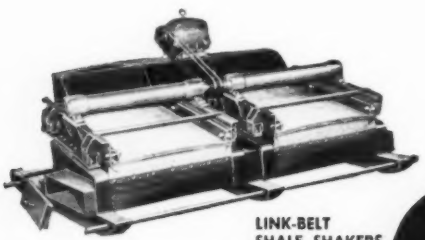


ROLLER BEARING PILLOW BLOCKS

Press-fit or adapter type mounting, split housing, open or closed end, fixed and floating bearing types, grease or oil lubricated, wide range of bearing bores.

A. P. I. Rotary Chains

Link-Belt manufactures a complete line of A.P.I. oil drilling chains for every drilling service. A complete line of these chains is available which includes A.P.I. 3 and A.P.I. 4 Red-Hed, SS-3125 Hyper Single and SS-3125 Hyper Double, SS-40 Hyper, SS-124 Three-Bar Hyper and A.P.I. 4 Super Hyper. Well balanced design, proper selection of materials and accuracy in manufacture make these chains the strongest, most dependable for the severe service encountered in oil well drilling. These chains can be operated on cut tooth sprockets and we suggest their use for smooth, uninterrupted operation.



LINK-BELT SHALE SHAKERS

Available in single or dual sizes . . . made in three unitized sizes, including intake boxes: NRM-124—24"x48", NRM-145—48"x60" and NRM-134—36"x48". Specify dependable L-B Shale Shakers. They'll keep you out of mud trouble.

LINK-BELT

THE SYMBOL OF QUALITY — L-B — A LINK-BELT

CHAINS • SPROCKETS • DRIVES
SHALE SHAKERS

BENNY ROBINSON, Party Chief on Crew No. 5, started digging shot holes for Independent right after he got out of Louisiana Tech 15 years ago. He has progressed through practically every job on a geophysical crew, having worked as shooter, recorder, surveyor, and computer, before being made a party chief. Such long and thorough experience is typical of the seasoned men who head all Independent Exploration crews, where the average experience of party chiefs is 15 years in seismograph field work.

It's a Deep Secret!

The location of oil reserves far below the earth's surface is one of nature's carefully guarded secrets. For 17 years a long list of important oil producers have depended on the experienced crews of Independent Exploration Co. for scientifically accurate recording and interpretation of this essential subsurface data.

POINTING THE WAY
IXC
FOR THE DRILL

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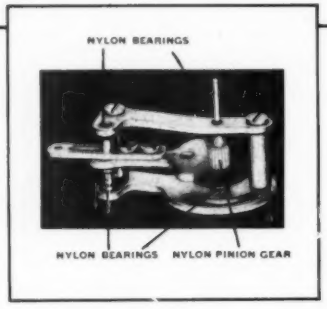
Every Engineer should read this!



THE TREND in gauge movement design over the years has been in the direction of increased bearing diameters and lengths, width of tooth engagement, hardness of wearing surfaces, and mass of parts in order to achieve *greater wear resistance.*

But in increasing the mass of parts, accuracy and sensitivity are invariably impaired and wear resistance is not necessarily improved. The high impact effect at bearing and other wearing points, which is related to the natural weight of the metal used, *creates wear!* The "products of wear" increase the rate of wear and when carbon particles are exposed, they rust.

The ideal conception of a gauge movement should, therefore, incorporate lightness in parts which move to enhance sensitivity and accuracy of indication and to lessen impact effects on severe service. The "products of wear" should not cause increased wear or be susceptible to atmospheric corrosion. The materials used at bearing and other wearing points should absorb or soften impact. Adequate strength and general corrosive resistance must be provided.

The Ashcroft Duragauge Nylon-Aluminum Movement* is a break with tradition, a completely new and revolutionary approach to movement design. It meets fully all these requirements!

The nylon parts provide impact absorption, retention of accurate form shape under sufficiently high temperature, no objectionable wear products (should any form), low friction and adequate corrosion resistance.

Aluminum contributes lightness in the mating parts which reduces potential impact to its lowest terms and increases sensitivity. The anodized surfaces enhance the low frictional properties of the aluminum. In contact, the aluminum tends to glaze the nylon which increases the wear resistance and lowers the coefficient of friction. The general corrosive resistance of aluminum is very good. And even in the case of such chemicals as methyl chloride and methyl bromide, which should not be used in direct contact with aluminum base alloys, the Nylon-Aluminum Movement in the Duragauge Vapor Proof case stood up well.

In laboratory and field tests on the worst pulsating services to be found, the Duragauge Nylon Movement outwore all other movements of whatever material or design.

In installations on "killing" services in refineries, chemical plants and power stations, the Nylon Movement showed its inherent superiorities.

We invite your inquiries concerning this new Ashcroft Duragauge movement.

**Pat. Applied For*

Stocked and sold by leading distributors everywhere

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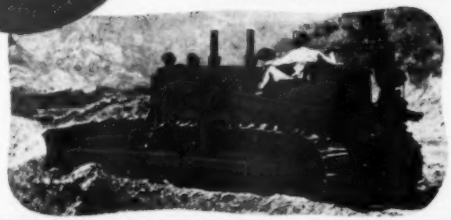
1850 ASHCROFT U.S.A.

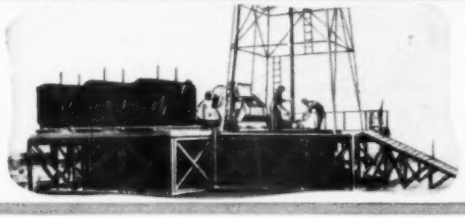
Makers of 'Ashcroft' Gauges, 'Hancock' Valves, 'Consolidated' Safety and Relief Valves, 'American' Industrial and 'Microsen' Electrical Instruments. Builders of 'Shaw-Box' Cranes, 'Budgit' and 'Load Lifter' Hoists and other lifting specialties.

5 FORCEFUL FACTS
ABOUT EFFICIENT OIL PRODUCTION

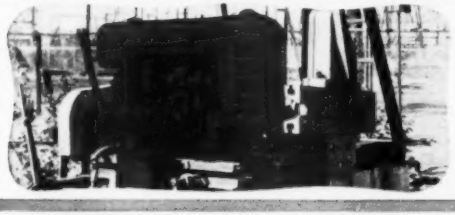


1 For Smoothing the Way . . .
to drill sites—building roads, leveling sites and hauling in heavy equipment—use International Crawlers. They are tough and ready to handle the hardest jobs, overcoming obstacles of difficult terrain.

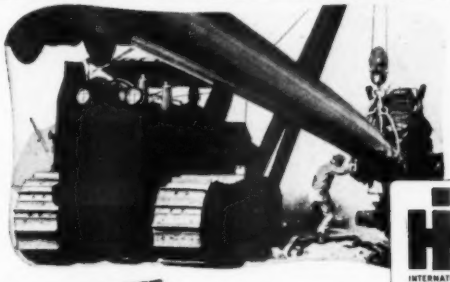
2 For Scooping Out Slushpits . . .
in a hurry use the time-tested workhorse of the oilfields—the International TD-14A diesel crawler. It's compact, easily moved from place to place and powerful enough to do most of the heavy work around the rig.



3 For Drilling Power . . .
you can't beat International Power Units, available in sizes up to 180 net horsepower. Use them to drive generators, rotary tables, draw works and mud pumps, with ease and economy. Whether you use a rotary or cable-tool rig, power it with an International.



4 For Pumping Wells . . .
there is no more efficient or economical power to use than the right size International Power Unit, equipped to burn waste gas. There's a model to match any pump-jack power requirement.



5 For Laying Pipelines . . .
big, medium or small—there are International Crawlers with matched side booms to do the job with speed and economy. No job is too big for Internationals to handle—or too small for Internationals to do economically.

Remember these five forceful facts
when you need oilfield power

INTERNATIONAL HARVESTER COMPANY
Chicago

Hear James Melton on "Harvest of Stars" NBC Sunday

INTERNATIONAL

CRAWLER TRACTORS
WHEEL TRACTORS
DIESEL ENGINES
POWER UNITS

SERVEL AIR CONDITIONING MEETS YOUR CONDITIONS BEST

- *Operates on* **NATURAL GAS OR MANUFACTURED GAS, BUTANE OR PROPANE**
- *Provides perfect indoor climate in any land, under any conditions*

The Servel ALL-YEAR Air Conditioner doesn't require any extra, expensive generating equipment . . . doesn't burden your present sources of electricity. That's because Servel uses *your* kind of energy—butane, propane, natural or manufactured gas (or steam). So wherever you're operating—in any land, any climate—Servel is the *practical* way to provide your staff with air cooling. Already many of these units are in use in the Middle East and elsewhere. And users have reported excellent results, low maintenance cost—no matter how severe the climatic conditions.

Servel's compact, central unit refrigerates the air . . . removes sticky, wilting humidity . . . brings freshening coolness to homes, stores, offices, clinics, and drafting rooms. Oversize filters sift out dirt, dust and irritating pollens. During times when prevailing temperatures are comfortable, Servel simply circulates draft-free air. All-year round, you have the climate you want—when you want it. You just dial the desired temperature . . . flip a switch . . . and you have instant, dehumidified cooling or clean, even warmth. We'll be glad to hurry further details to you. Just send us your address.

Servel Inc.
INTERNATIONAL DIVISION
20 PINE STREET, NEW YORK 5, N. Y., U. S. A.

. . . and Servel Refrigerators meet your conditions best, too. In the tropics . . . in the desert . . . *anywhere* . . . Servel keeps foods fresh, cools beverages, and makes plenty of ice cubes. For, like the ALL-YEAR Air Conditioner, the Servel Refrigerator operates on gas (butane, propane, natural or manufactured) . . . or kerosene. So there's no motor to wear . . . no moving parts in the freezing system to break down and need repair. Many of the more than 2,500,000 Servels in use throughout the world today have been functioning as long as 20 years.

REPUBLIC *Electric Weld* LINE PIPE

Delivers All 10 Field-Proved Points

Welders tack stringer beads *fast* when they're working with Republic Electric Weld Line Pipe. Their field experience proves that pipe ends must be uniformly round for perfect matching and fast tacking—and that's one more feature Republic Electric Weld Line Pipe delivers. Check all 10 listed below. The advantages of every single point have been proved by experience totaling over twenty years in all fields, and covering more than 51,000 miles of lines delivering oil, gasoline, natural gas and by-products.

1 Uniform Roundness—Pipe ends match up perfectly—speed construction—cut costs.

2 Uniform Diameter—No "off-size" lengths to cause welding difficulties at joints.

3 Uniform Wall Thickness—Absolute dependability throughout every inch of length and circumference.

4 Uniform High Yield Strength—Permits building of higher pressure lines—utilizing design values to fullest advantage.

5 Uniformly Straight—Lengths line up evenly—go into the ditch freely.

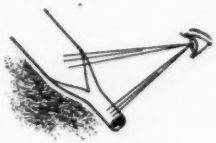
6 Easy to Bend—High-ductility steel makes bending in the field easy.

7 Easy to Weld—Low carbon steel welds readily—makes sound joints.

8 Freedom from Scale—Insures against clogged valves, contamination of petroleum products.

9 Long Lengths—Reduces number of joints—makes jobs move with longer strides.

10 Inspected Inside and Out—Republic Electric Weld Line Pipe is made from flat-rolled steel both sides of which are closely inspected. Thus, you are assured that the surface which becomes the inside wall when formed into pipe is free from hidden defects.



Write for literature.

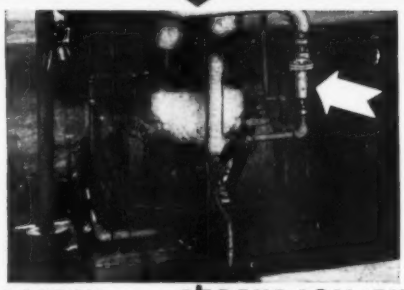
REPUBLIC STEEL CORPORATION
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Dept.: Chrysler Bldg., New York 17, N.Y.

Republic
REPUBLIC STEEL
ELECTRIC WELD LINE PIPE

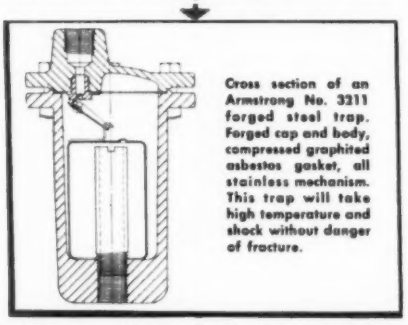
Other Republic Products include Casing and Tubing—Carbon, Alloy and Stainless Steels—Studs, Bolts and Nuts—Heat Exchanger Tubes

"Here's a Forged Steel Trap . . . for only $14.00 list"

SMALL PRICE
BIG BENEFITS



SAFETY . . . DEPENDABILITY



Cross section of an Armstrong No. 3211 forged steel trap. Forged cap and body, compressed graphited asbestos gasket, all stainless mechanism. This trap will take high temperature and shock without danger of fracture.

SMALL SIZE . . LIGHT WEIGHT

NOW, for many applications, refineries and natural gasoline plants can have the additional safety of a forged steel steam trap for only a few dollars more than a cast iron trap of comparable size. The Armstrong No. 3211 trap illustrated will withstand fire or explosion without danger of fracture. It is the baby of the Armstrong forged steel line, a low priced trap for working pressures up to 250 psi; design pressure, 450 psi. Capacity range 750 to 1000 lbs/hr continuous. ½" or ¾" pipe connections. Diameter 4¼"; height 7"; weight 8 lbs. This trap is a natural for refinery and natural gasoline plant service.

For higher pressures and larger capacities Armstrong builds a complete line of heavy duty forged steel traps. Ask your nearby Armstrong representative to quote on the traps you need now.

ARMSTRONG MACHINE WORKS
868 Maple St., Three Rivers, Mich.

SEND FOR your copy of the Armstrong Steam Trap Book giving complete data and prices on all Armstrong steam traps, both forged and cast bodies for all pressures, all applications. This 36-page book is a valuable reference for any engineer working with selection and installation of steam traps.

ARMSTRONG STEAM TRAPS

IT'S NEW...IT'S DIFFERENT...

IT'S *Here!*

GOODALL FLEXO CORD

LONG LIFE *Rotary Hose*

...first and only rotary hose with CORD CARCASS!

Here, at last, is a rotary hose that has the *guts* to resist torsional twist — cause of 90% of rotary hose blow-outs! It looks the same as the famous Goodall FLEXO Long-Life Rotary Hose you've been using for years. But *inside* — under the cover where it counts — there are radical new improvements in materials and construction that mean longer, better service . . . easier handling . . . greater value for your money!

New Construction

Goodall is the first manufacturer of rotary hose to successfully develop a cord carcass to replace the canvas duck carcass that, up to now, has been standard for rotary hose.

This new construction makes Goodall FLEXO *CORD* Rotary Hose as far superior to ordinary rotary hose as cord automobile tires are superior to old-fashioned fabric tires.

Here are some of the reasons why you get greater durability, better performance and longer life from the new Goodall FLEXO *CORD* Rotary Hose. In the first place, the cord carcass has far greater tensile strength than the canvas duck material it replaces. Equally important, it is laid in multiple plies at precisely the correct transverse angles to resist the destructive torsional twist that causes a fabric carcass to cut itself to pieces.

Perfect Balance

Perfect balance — an essential to flexibility, long life and trouble-free performance — is assured by the new Goodall method of winding the multiple cords of the carcass and the steel cables of the pressure element at corresponding angles. This neutralizes the tendency of the hose, under pressure, to elongate and distort. It also results in greater flexibility for easier handling . . . permits the hose to hang evenly in the rig.

Costs No More!

Extensive field tests under severe drilling conditions have proved that the new, improved Goodall FLEXO *CORD* Rotary Hose has what it takes to withstand torsional twist, whipping, jerking, pulsation and rough handling better than any premium hose ever manufactured. It gives you longer service life and better performance—at no additional cost!

Take advantage of these revolutionary new improvements. Next time you order, specify Goodall FLEXO *CORD Rotary Hose!*

To get longer service from your Goodall Rotary Hose, use a swivel joint at each end.

GOODALL "EXTRAS"

Barney Couplings — the only couplings stronger than the hose itself.

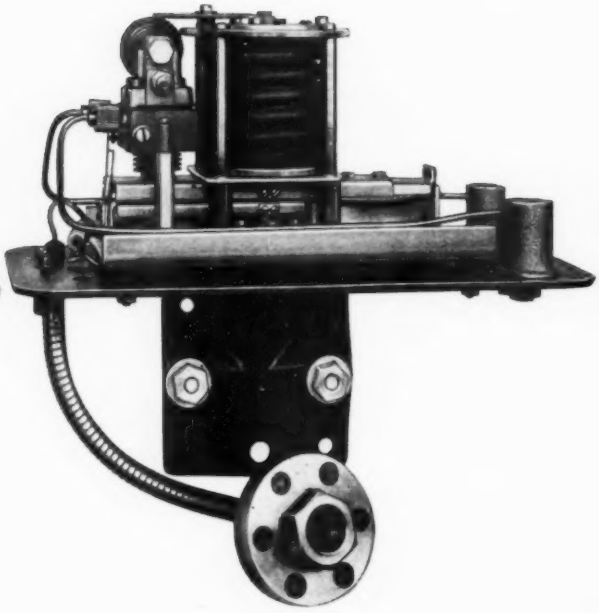
GOODALL SERVICE DEPARTMENT

The only complete repair department maintained exclusively for rotary hose.

GOODALL RUBBER COMPANY
TRENTON, N. J.

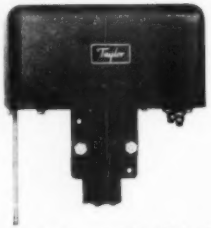
GOODALL RUBBER COMPANY OF TEXAS: Houston, Texas
GOODALL RUBBER COMPANY OF CALIFORNIA: San Francisco, Los Angeles, Seattle, Salt Lake City
GOODALL RUBBER COMPANY: New York, Philadelphia, Pittsburg, Chicago, Denver, St. Paul
EXPORT: Goodall Rubber Company, Trenton, N. J.
DISTRIBUTORS: Texas and Louisiana — Houston Oil Field Material Co. — Wilson Supply Co., Oklahoma — Iverson Supply Company

Now you can measure and transmit smallest pressure changes with TAYLOR ACCURACY!



New Taylor TRANSAIRE* Pressure Transmitter with

NARROW RANGE SPANS



FIRST TIME in history! A simple force-balance pressure instrument that measures and transmits the smallest pressure changes up to 1000 ft. with an accuracy of ½% of the range span (*conventional devices are only accurate up to ½% of upper range limit.*)

Taylor's new TRANSAIRE Pressure Transmitter gives you accuracy and sensitivity never before possible in pressure measurement—plus the convenience of suppressed ranges at high pressure levels.

SEVEN IMPORTANT ADVANTAGES:

1. RANGE SPANS OF 20 AND 40 PSI available throughout range limits of 35 to 415 psia. With accuracy established at ½% range span, you can expect precise measurement to .1 psi with 20 psi spans, and .2 psi with 40 psi spans—and consequently proportionately closer control.

2. VOLUMETRIC TYPE PRESSURE SYSTEM is extremely accurate. Being a completely closed system there is practically no hazard of clogging. Type 316 stainless steel diaphragm and connection give maximum corrosion resistance.

3. PERFECT FOR MANY JOBS, especially on thin fractionating columns in chemical and petroleum industries, etc.

4. STANDARDIZED 3 TO 15 PSI OUTPUT Air Pressure means you don't have to individually calibrate receivers or receiver-controllers. Instrument transmits output pressure in proportion to measured pressure with accuracy of ±0.06 psi.

5. OPERATING RANGE VARIED by simple screwdriver adjustment.

6. INTERCHANGEABLE MANIFOLD ASSEMBLIES make 20 and 40 psi range spans optional.

7. INSTRUMENT QUICKLY TRANSFERRED from one job to another having different range by simply inter-changing spring sub-assemblies.

This Taylor TRANSAIRE Pressure Transmitter is another step in Taylor's program to produce industrial instrumentation unsurpassed in *accuracy*, *simplicity*, and *durability*. We're doing this, of course, to help you keep costs down and quality up. Ask your Taylor Field Engineer! Or write for **BULLETIN 98099.** Taylor Instrument Companies, Rochester, N. Y., and Toronto, Canada.

Instruments for indicating, recording and controlling temperature, pressure, humidity, flow and liquid level.

* Trade Mark

TAYLOR INSTRUMENTS MEAN ACCURACY FIRST

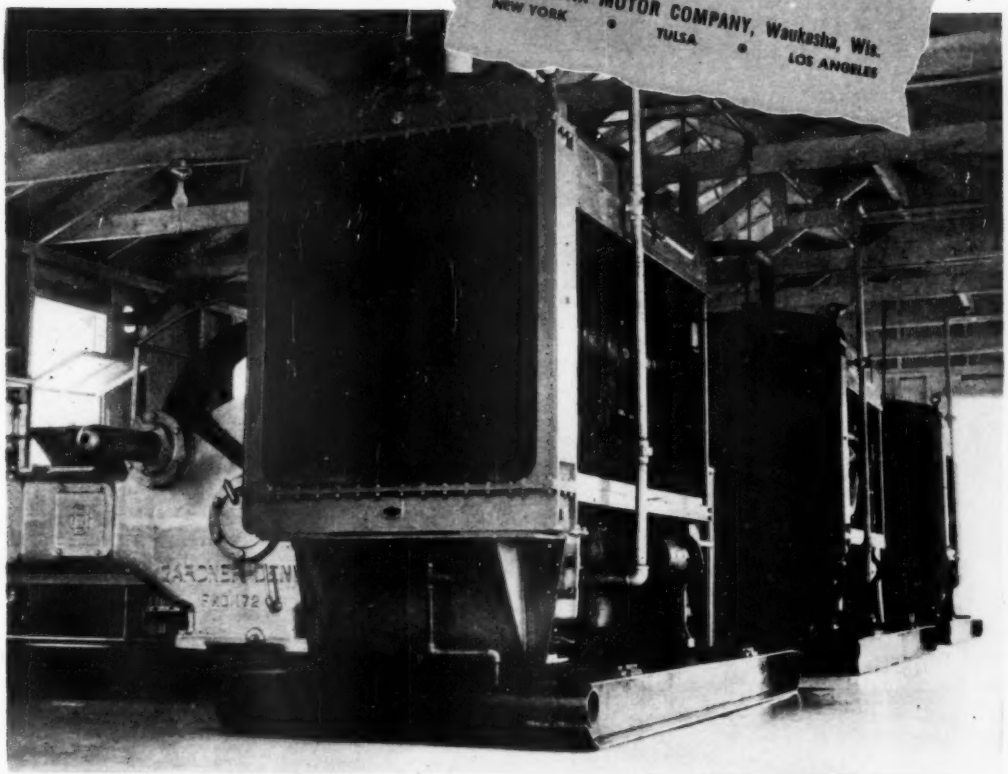
WAUKESHA POWER PUMPS

13,000,000 BARRELS!

● In the LION OIL COMPANY pipe line station at Magnolia, Ark., these three 145-GKU Waukesha Gas Power Units are working about 16 hours a day—driving 5 x 10 Gardner-Denver pumps operating at 700 pounds pressure. These Waukeshas have been in operation for four years or more, and during that time they have pumped 13,000,000 barrels.

That's real, rugged dependability. And it's built right into this six-cylinder, 5¼-in. x 6-in., 779 cu. in. Model 145-GKU with its hard alloy valve seat inserts, removable wet sleeve cylinders, gear-driven oil and water pumps, thermostat controlled cooling, precision bearings, husky 7-bearing crankshaft. For all the details—send for Bulletin 1225.

WAUKESHA MOTOR COMPANY, Waukesha, Wis.
NEW YORK ● TULSA ● LOS ANGELES



WAUKESHA ...Gas Power
Diesel Power... POWER

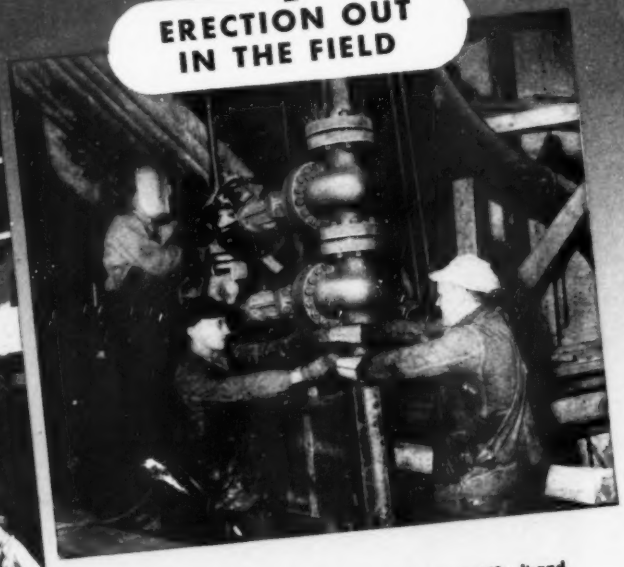
YOU GET BETTER PIPING

because MIDWEST knows piping problems

INSIDE and OUT

PREFABRICATION IN THE SHOP

ERECTION OUT IN THE FIELD



Because Midwest has erected some of the most difficult and exacting piping jobs out in the field, in addition to having prefabricated them in the shops, we have a clear, competent view of piping problems from every angle.

Our Fabricating Department works closely with the Contracting Department . . . continually seeking ways of making their job easier, less costly, and higher in quality. The Contracting Department is always ready to make practical suggestions for improving prefabricated piping subassemblies. It is in constant and intimate touch with piping users in all types of industry. Changes in needs—changes in thinking are quickly relayed to the whole Midwest organization.

The net result to you is better piping whether you want a simple pipe bend . . . a series of complex prefabricated subassemblies . . . or a difficult piping job completely erected.

MIDWEST PIPING SERVICE IS NATION-WIDE

4 PLANTS ARE BETTER THAN 1

PIPING FABRICATORS AND CONTRACTORS

MIDWEST PIPING & SUPPLY COMPANY, INC.

Main Office: 1450 South Second Street, St. Louis 4, Mo.

Plants: St. Louis, Passaic, Los Angeles and South Boston

Sales Offices: New York 7—30 Church St. • Chicago 3—79 West Monroe St.
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A completely rebuilt motor is tested with dynamometer. This machine applies low voltage and overloads exactly as in actual usage.

Complete Facilities

KEEP ELECTRIC MOTORS ON THE JOB

California Electric Works, San Diego, features modern equipment, large stock of parts, 2 shift operation, 24 hour service in emergencies to give top-flight Allis-Chalmers Certified Service

IN SAN DIEGO, and *every* major industrial center in the United States you will find an outstanding, independent Allis-Chalmers Certified Service shop.

These shops have been carefully picked for their experience, highly skilled workmen, modern equipment and business reputation. Each uses nothing but factory approved methods and parts.

So when you need service on electrical equipment, call the nearest Allis-Chalmers Certified Service shop. You can be sure of fine workmanship, fast service and fair prices.

GOOD SOURCE FOR NEW MOTORS, TOO

Your Allis-Chalmers Certified Service Shop or Authorized Dealer can give you the same fast, dependable delivery on new motors. Whichever you need, new motors or service on your present equipment, you can depend on your Allis-Chalmers Certified Service shop. A-2885

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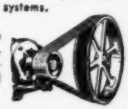
Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

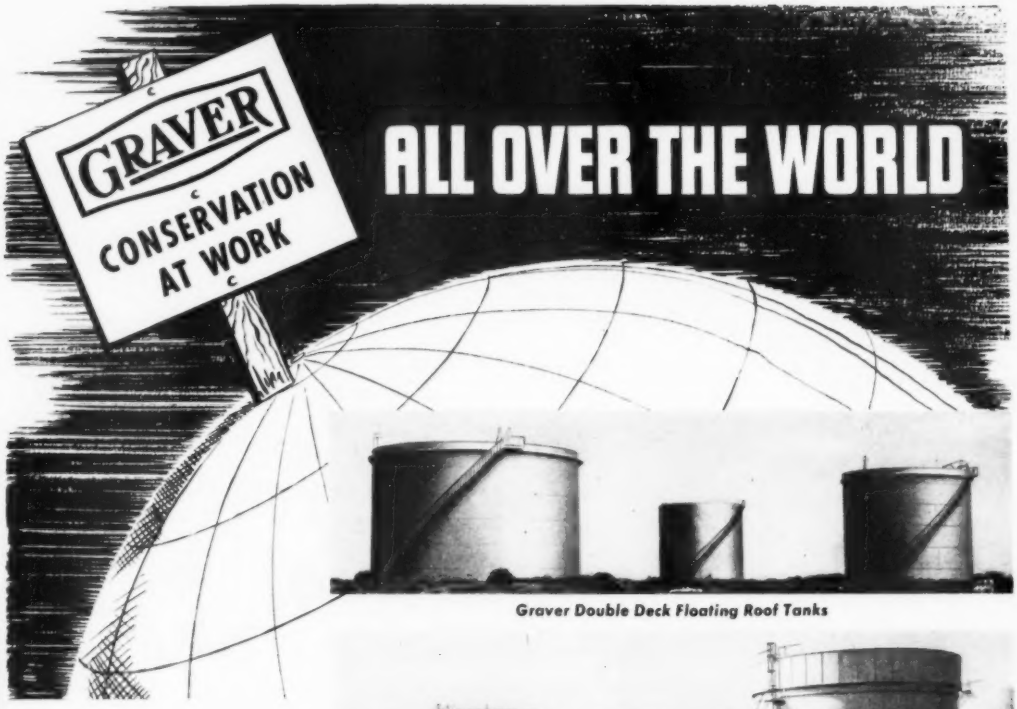
TEXROPE — Belts in all sizes and sections, standard and Vari-Pitch sheaves, speed changers.



PUMPS — Integral motor and coupled types. Sizes and ratings to 2500 GPM.

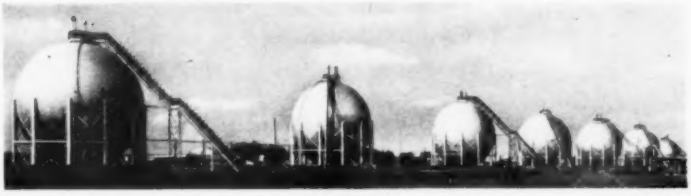
Texrope and *Vari-Pitch* are Allis-Chalmers trademarks

ALLIS-CHALMERS



Graver Double Deck Floating Roof Tanks

Graver Expansion Roof Tanks Manifolded to Cone Roof Tanks



Graverspheres

Graver Pressure Vessels

Look at refineries and terminals wherever you go and you will see Graver conservation equipment at work, positively preventing vapor losses for producers, refiners, and marketers. The proven performance of the Graver Expansion Roof makes it the choice of the world's leading oil and pipe line companies . . . and the records of savings with Graver Floating Roofs, Pressure Vessels and Graverspheres are equally convincing.

For complete details and case histories, call a Graver representative—today.

GRAVER

FABRICATED PLATE DIVISION

GRAVER TANK & MFG. CO., INC.

EAST CHICAGO, INDIANA

NEW YORK • PHILADELPHIA • CHICAGO • CATASAUQUA, PA. • HOUSTON • SAND SPRINGS, OKLA.

Fast, Easy Shifting Under All Conditions with the New Eaton *Electric* Shift

The new Eaton electrically powered, push-button controlled shift for Eaton 2-Speed Truck Axles provides easy, positive shifting at any speed, on any grade. Shifting is easier and smoother because the actuating force is uniform at all times—unaffected by altitudes. The simplicity of the Eaton operating mechanism makes for minimum maintenance cost.

This exclusive Eaton Electric Shift provides for easier driving and greater safety—and improved axle and vehicle performance. See your truck dealer for the full story of Eaton electrically controlled 2-Speed Axles.

More Than a Million Eaton 2-Speed Axles in Trucks Today

EATON *2-Speed Truck* AXLES

Axle Division

EATON MANUFACTURING COMPANY

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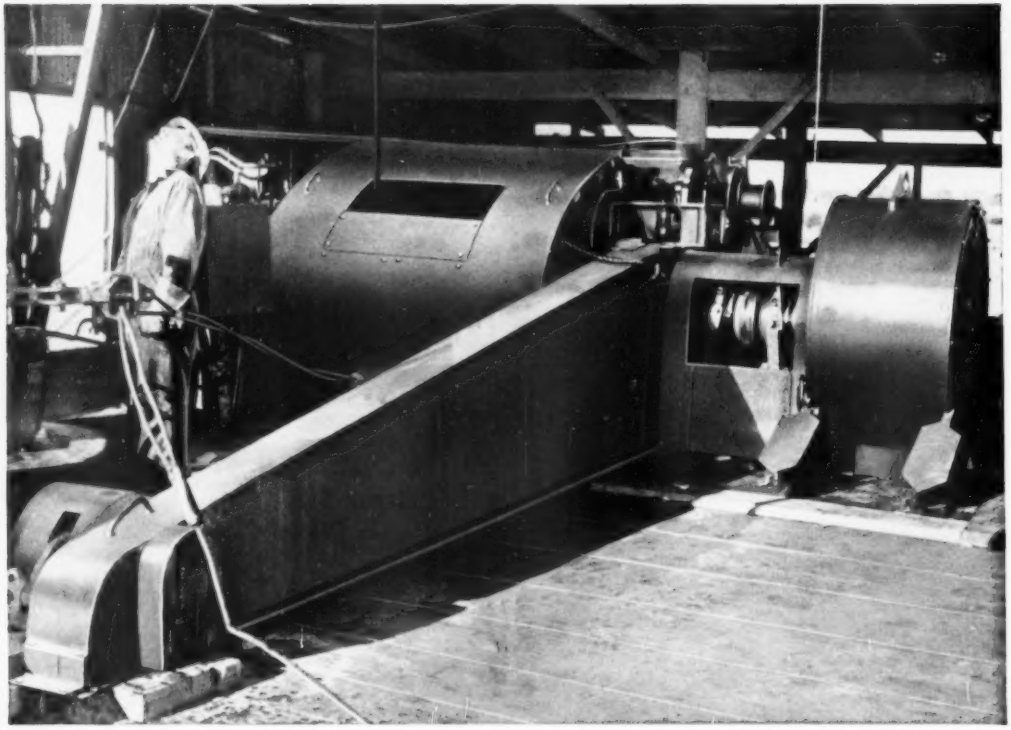
PRODUCTS: SODIUM COOLED, POPPET, AND FREE VALVES • TAPPETS • HYDRAULIC VALVE LIFTERS • VALVE SEAT INSERTS • ROTOR PUMPS • MOTOR TRUCK AXLES • PERMANENT MOLD GRAY IRON CASTINGS • HEATER-DEFROSTER UNITS • SNAP RINGS • SPRINGTITES SPRING WASHERS • COLD DRAWN STEEL • STAMPINGS • LEAF AND COIL SPRINGS • DYNAMATIC DRIVES, BRAKES, DYNAMOMETERS



For Precision Control of Heaviest Strings

The Dynamatic Drawworks Brake provides accurate finger-tip control at driller's position of heaviest strings of pipe or casing. Completely magnetic. No brake blocks or bands. No friction; nothing to wear out.

- Simple as a light circuit.
- High torque at low speeds.
- Operates on ordinary light plant current.
- Proven in all major fields, including off-shore drilling.
- Readily applied to all rigs—large or small. Can be installed in the field.

Dynamatic Drawworks Brakes are available from drawworks manufacturers and their distributors. Write for illustrated literature.

DYNAMATIC
ELECTRO-MAGNETIC

DRAWWORKS BRAKES

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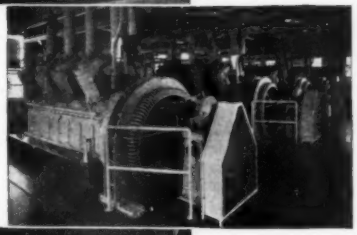
DYNAMATIC DIVISION KENOSHA, WISCONSIN

EATON MANUFACTURING COMPANY, CLEVELAND, OHIO

at Vanderbilt, in the West Ranch Field of the MAGNOLIA PETROLEUM COMPANY

THERE'S MORE THAN MEETS THE EYE

Left: These two Type CNT pumps circulate lean oil to three absorbers and one reabsorber.



Right: Natural gas brought into the plant provides fuel for driving these four Ingersoll-Rand 4-cycle V-angle generator units.

Left: The finished products at Vanderbilt are handled by this array of I-R "Motorpumps."

Under the maze of piping and processing units of the recently completed Vanderbilt natural-gasoline extraction plant, *Ingersoll-Rand pumps and gas engines play a vital role.*

The daily processing of 40,000 gallons of liquid hydrocarbons requires many types of pumps. Here, at Vanderbilt, the major portion of the centrifugal pumping assignment —from circulating cooling water to delivering the finished products to tank cars and trucks for shipment—bears the Ingersoll-Rand name.

Power for driving the pumps, cooling-tower fans, for lighting the plant, and for home use of the operating personnel is generated by four 375-kva generators each driven by an Ingersoll-Rand Type PVG, 4-cycle V-angle gas engine.

Yes, at Vanderbilt—as in so many other important industries — Ingersoll-Rand equipment plays a vital role.

336-14

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y.

COMPRESSORS · AIR TOOLS · ROCK DRILLS · TURBO BLOWERS · CONDENSERS · CENTRIFUGAL PUMPS · OIL AND GAS ENGINES

Don't risk decay— use clean

PENTA-PROTECTED Wood

chlorophenol

Long lasting— will not Leach!

ON MARINE PLATFORM LUMBER . . .

Don't take chances with wood decay! Use PENTA-treated wood and know you're safe. PENTA-protection is effective protection against both decay and wood-attacking insects. PENTA-PROTECTED wood is clean, easy to handle, and lasts for years. The low water solubility of PENTAchlorophenol prevents leaching under the most adverse conditions.

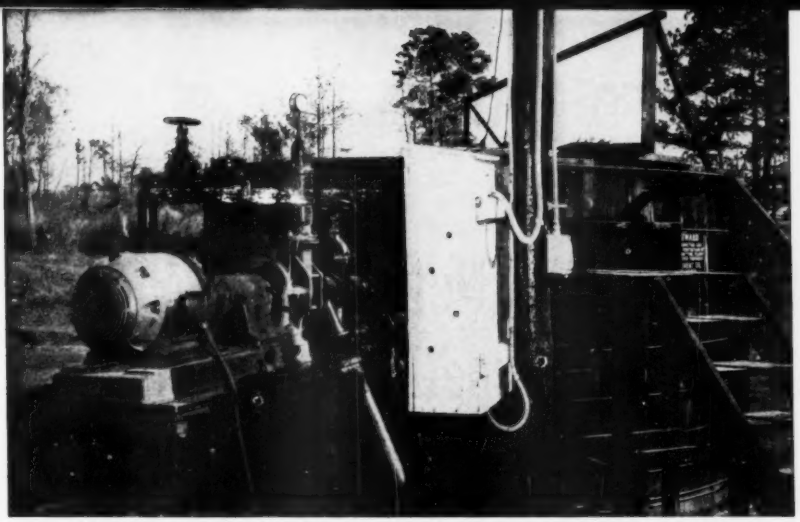
Ask your lumber supplier for PENTA-PROTECTED wood. For more complete information write Dow, Dept. PE 203.

DOW

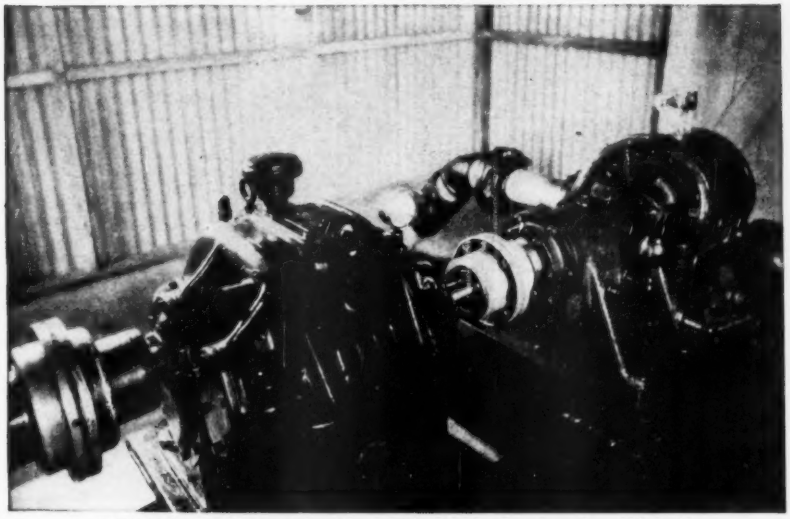
penta-

chlorophenol

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN



CT Worthite pump, transfers salt water from nearby wells to treating plant. Note isolated location where pump gets only occasional servicing



2½ HBLC-5 Worthite pump handling 5500 barrels of salt water a day at Magnolia Petroleum Co., Talco, Texas

Worthite Licks Salt Problem

In disposing of the salt water that is produced with oil from some of the older production fields, the cost of maintaining transfer and injection pumps made of iron, steel and bronze has been very high.

Since pumping stations in a large field are located over many square miles, a large crew of men is needed for frequent inspection and maintenance. But when Worthite gathering or transfer pumps are installed in these inaccessible places, they need *no* attention for long periods of time because *there is no corrosion.*

The photograph shows a Worthite 2-stage centrifugal pump on salt water injection service, installed by Magnolia Petroleum Co. in 1941 in their East Texas Talco field. No repairs have been required in eight years of operation. Only occasional packing and lubrication have been needed.

Also shown is a CT Worthite pump which transfers salt water from nearby wells to the treating plant. Note that this pump can be located in an isolated section because only occasional servicing is needed.

Casing, impeller and ring are cast in Worthite—a Worthington complex alloy containing 52% of alloying elements—Ni, Cr, Mo, Cu, Si, Mn.

NEWS

FROM THE PETROLEUM FRONT

AS REPORTED BY THE DEVELOPMENT ENGINEERS, FIELD SERVICE REPRESENTATIVES AND CUSTOMERS OF WORTHINGTON

1

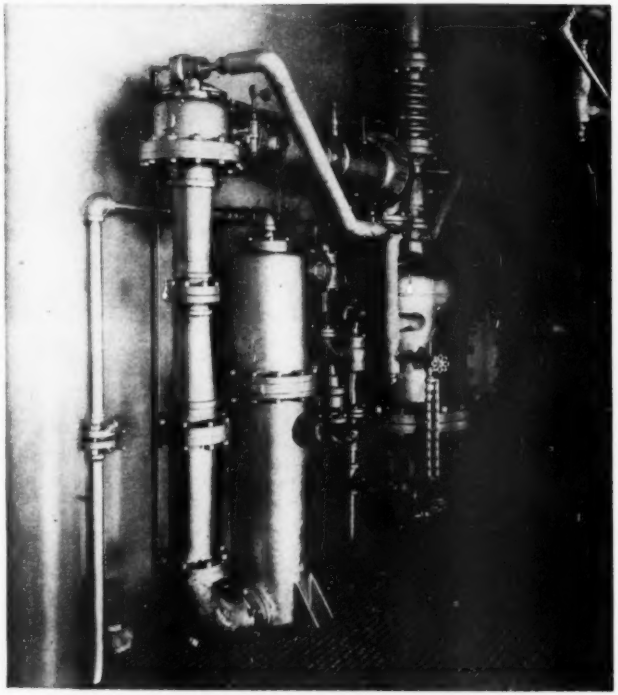
Worthington's Nothing Is Plenty To Shell's Experimental Work

How Worthington's Steam-Jet Ejector's Unusual Vacuum Characteristics Help Shell's Research Program

Creating an unusually high vacuum is the important part a Worthington 6" RPD steam-jet ejector plays in the research program on basic petroleum products, conducted at Shell Oil Co.'s experimental laboratory at the Martinez, Calif. refinery.

Serving a batch lube oil still, the ejector, single element, four stage with barometric inter-condenser between 2nd and 3rd stages, has a first stage which is steam-jacketed to prevent freezing within the stage. The inter-condenser is of the low-level type drained by a motor-driven centrifugal tail pump. Automatic controls are used to prevent flash backs of steam and water to the still in the event of power failure.

The ejector was installed about 1 year ago and handles 14 lb per hour total mixture at 1 mm hg abs. suction pressure. The 14 lb per hour is made up of 2 lb per hour air, plus 12 lb per hour water vapor. This is equivalent to approximately 3200 cu ft per minute. The unit requires 243.5 lb per hour steam at 90 psi and 33 gpm water at 73 F.



Worthington Steam Ejector at Shell Oil Co.'s Martinez, Calif. refinery

Paraffin Distillate Chilling

The huge Baton Rouge, La. refinery of Esso Standard Oil Company has a daily crude oil run of about 240,000 barrels. Since its conception in 1909, the plant has processed more than one billion barrels of crude oil—a record only a few refineries in the world hold.

The plant now produces such major products as: synthetic rubber, alcohol, liquefied gases, chemical raw materials, motor and 100 octane gasoline, solvent naphthas, kerosene, distillate fuels, lubricating oils and greases, asphalts, paraffin waxes, petrolatums, and has been responsible for the development of many of the processes related to these and other products.

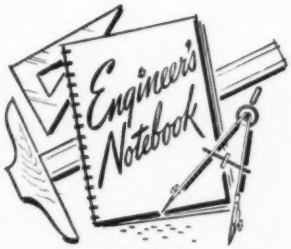
To increase its wax production, the refinery recently installed three Worthington double-pipe, scraped-surface, inclined* chilling machines and a complete ammonia refrigeration system using a 400 hp Worthington LTC-3 gas engine-driven ammonia compressor.

The charge stock-paraffin distillate, consisting of approximately 16% wax, is cooled in the inner pipes of the chilling machine. Spring loaded scrapers keep the inner pipes clean.

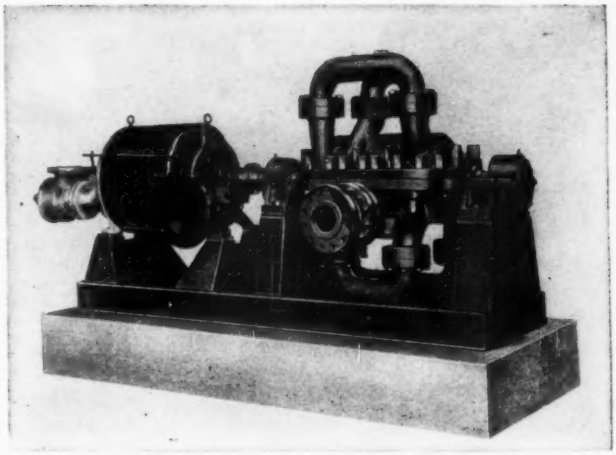
*Patented

Worthington Pump and Machinery Corporation
Harrison, N. J.

NEWS



Hydraulic Decoking



Worthington Turbine Driven High-Pressure Decoking Pump

Probably the most important recent improvement in the process of making coke is the hydraulic method of removing the coke from the coking drums.

Hydraulic coke removal and transportation is an efficient, inexpensive method, which eliminates the high cost, danger, and lost-time factors of hand labor, and delivers a premium grade of coke. This method was devised by the Shell Oil Company, and developed by Worthington Pump and Machinery Corporation and the Allen-Sherman-Hoff Company, to a point where the coke need never be seen until it reaches storage.

High impact-producing hydraulic jets bore a hole downward through the center of the coke bed. Following this, the cutting tool is used to remove the coke, which, falling with the water, drops into a sizing and feeder car that feeds coke of the proper size and quantity to a sump. From the sump, a hydroseal pump transports the mixture of coke and water to a coke pile or hydrobin. If the demand for coke is seasonal, a coke pile is used. In addition to serving as a storage place, the coke pile is also used to filter the water so it can be recirculated. Where space is limited and the coke must be shipped almost immediately, a hydrobin is incorporated in the system. The hydrobin is a large elevated bin, of conical construction, which separates the water from the coke, making it suitable for hauling within a few hours. Classification of the coke as to size can be made by the installation of screens on top of the hydrobin.

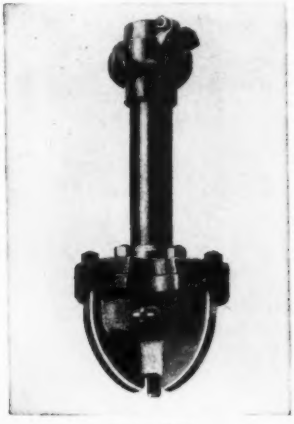
A third method of transportation and collection involves dropping the coke and water from the chambers directly into railroad gondolas. The water escapes through holes in the sides, and the coke is hauled to the coke pile and dumped or unloaded by means of a clamshell.

The advantages of hydraulic decoking are numerous. Due to the faster turn-around time possible with hydraulic decoking, the number of coking drums is reduced for a given plant capacity, thereby reducing the initial investment.

Hydraulic decoking is a labor-saving method. Three to seven men are required to operate the system during the cleanout period. Accident hazards are reduced, as men do not enter the drums. Dust hazard is eliminated, as coke is handled in a wet state. Maintenance costs are reduced.

Hydraulic decoking removes all the coke, completely eliminating loss in capacity. It also produces a coke free of contamination.

If further data is desired, please ask for bulletin WP-1099-B20C.

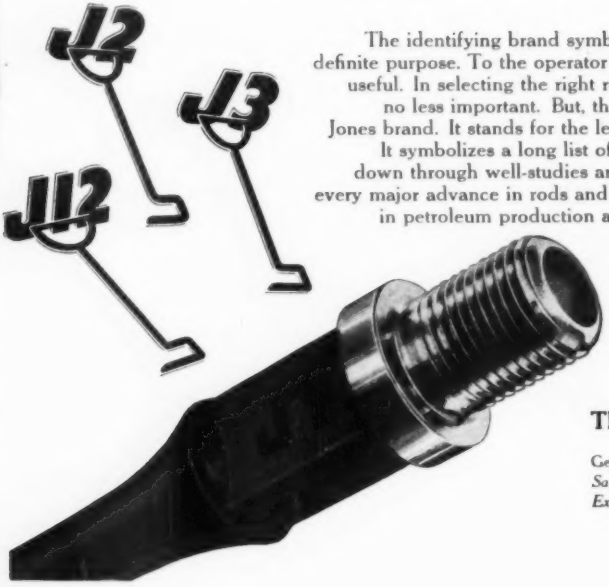


Boring Tool

Final Cutting Tool

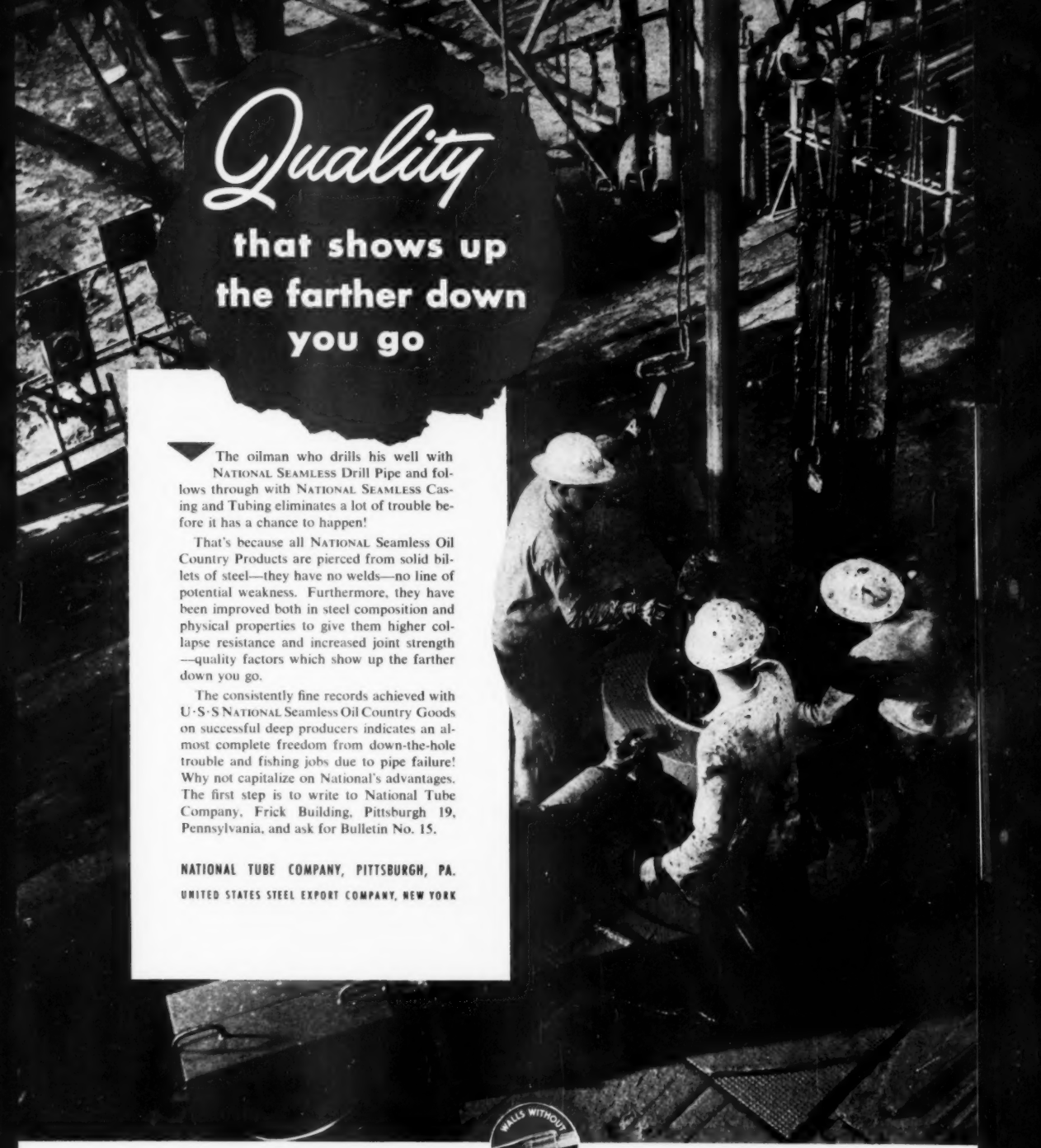
9-50

A BRAND WITH A MEANING...



The identifying brand symbols on each Jones sucker rod serve a definite purpose. To the operator who keeps rod records, they are especially useful. In selecting the right rods to run in a particular well, they are no less important. But, there is a far more important meaning to the Jones brand. It stands for the leadership of more than half a century. It symbolizes a long list of "firsts" from the first all-metal sucker rod down through well-studies and research and includes practically every major advance in rods and their use. It is instantly recognized by those in petroleum production as a mark of quality in sucker rods.

THE S. M. JONES COMPANY
(Subsidiary of Buffalo Bolt Company)
General Office and Factory: TOLEDO, OHIO
Sales Office: Kennedy Building, Tulsa, Okla.
Export Sales Office: Buffalo International Corp.
50 Church Street, N. Y. C.



Quality

that shows up the farther down you go

The oilman who drills his well with NATIONAL SEAMLESS Drill Pipe and follows through with NATIONAL SEAMLESS Casing and Tubing eliminates a lot of trouble before it has a chance to happen!

That's because all NATIONAL Seamless Oil Country Products are pierced from solid billets of steel—they have no welds—no line of potential weakness. Furthermore, they have been improved both in steel composition and physical properties to give them higher collapse resistance and increased joint strength —quality factors which show up the farther down you go.

The consistently fine records achieved with U·S·S NATIONAL Seamless Oil Country Goods on successful deep producers indicates an almost complete freedom from down-the-hole trouble and fishing jobs due to pipe failure! Why not capitalize on National's advantages. The first step is to write to National Tube Company, Frick Building, Pittsburgh 19, Pennsylvania, and ask for Bulletin No. 15.

NATIONAL TUBE COMPANY, PITTSBURGH, PA.

UNITED STATES STEEL EXPORT COMPANY, NEW YORK

WALLS WITHOUT WELDS

USS

NATIONAL SEAMLESS

drill pipe...casing...tubing

UNITED STATES STEEL

More Power to the Oil Industry through LUNKENHEIMER VALVES

LUNKENHEIMER manufactures high quality Globe, Gate, Angle and Check Valves in bronze, iron and steel for all pressures and temperatures. Wherever oil is produced, processed or transported, you'll find them specified for dependability and low-cost upkeep.

Lunkenheimer Distributors are stocked and equipped to provide prompt service in every oil producing center.

Eight inch gate valves—
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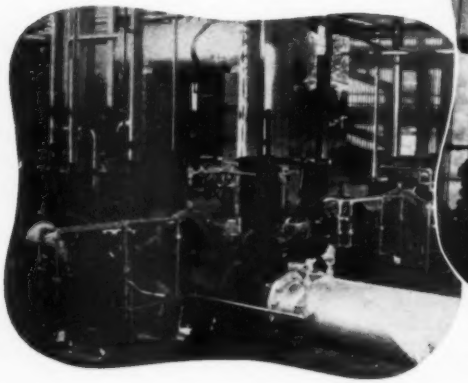
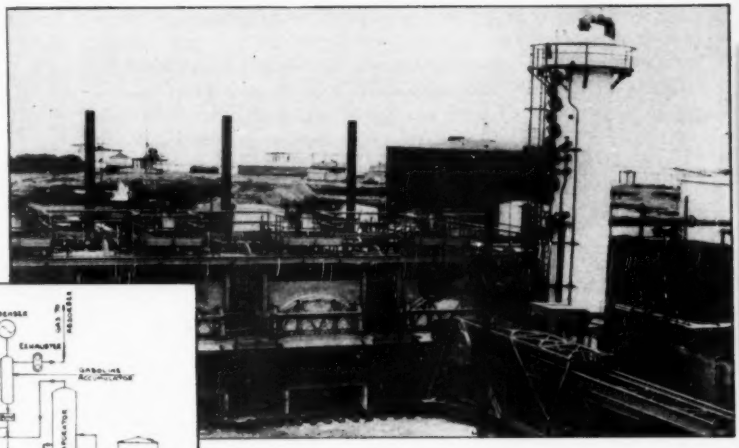
Natural gasoline plant—Louisiana



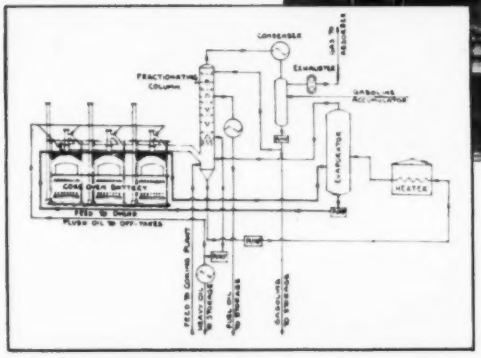
Six inch gate valves on Heat exchanger—Mississippi

PROBLEM: **How to Profitably Convert Residuums to Metallurgical Coke or Electrode Carbon**

SOLUTION: **Curran Carbonizing Process: A flexible and economical method of high temperature coking**



Curran Liquid Hydro-Carbon Coking Plant



Simplified Flow Diagram of Curran Process

The problem of profitably reducing petroleum residues to high-quality solid coke has been met and mastered in the Curran Carbonizing process . . . a tried and proven method of high temperature coking that should interest every organization desirous of converting heavy residues to readily saleable products.

The facilities of our completely equipped Pilot Plant are available for tests of your material on a commercial scale and at actual cost to us. Inquiries are invited and will receive prompt attention. Wire, write or phone.

Curran Carbonizing & Engineering Co.

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NOW MORE DEPENDABLE THAN EVER
CONTINENTAL RED SEAL POWER

It has been a long, long time—nearly half a century, in fact—since the word DEPENDABLE was first used to describe Red Seal power. And oil men know through first-hand experience that the term still applies with all its original force. Paced by advances both in metallurgy and in manufacturing technique, Continental design has become progressively simpler and more compact, while the ratio of power to weight has moved steadily up.

Such features as full-length water jackets, directional cooling, leakproof water pump, roto valves, removable tappets, patented oil and dust seals and patented individual porting team up for top economy, long trouble-free life. Finally, the broad diversification of the Red Seal line—availability for use with any fuel, and provision of at least one model engineered for each specialized oil field need up to 140 horsepower—carries to an all-time peak not only dependability but users' satisfaction as well, by making possible the perfect matching of the engine to its work.

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Continental Motors Corporation
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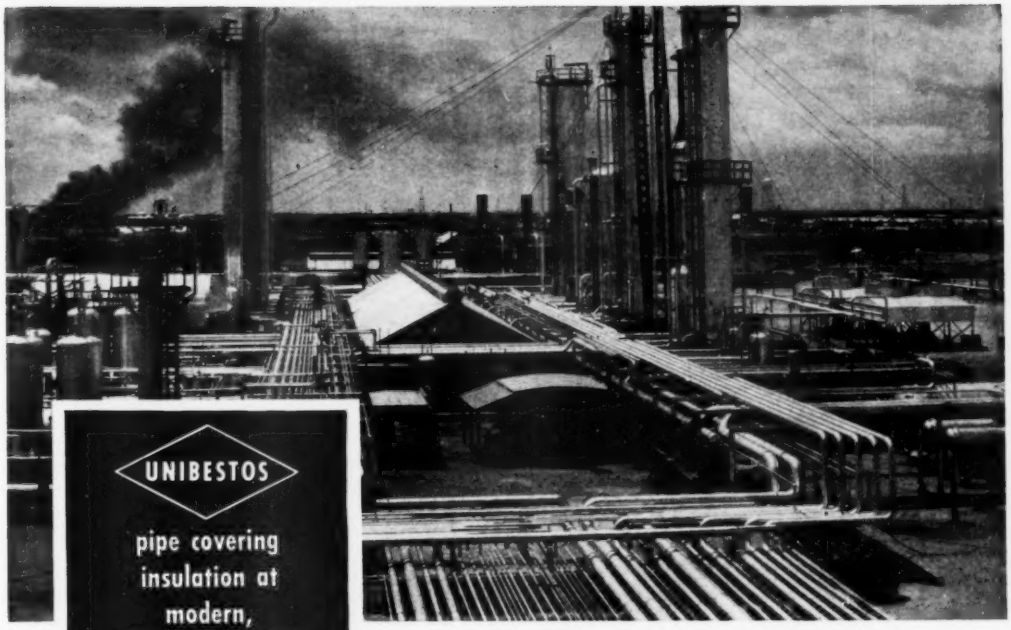
6218 CEDAR SPRINGS ROAD • DALLAS 1, TEXAS

Model F-162
Closed Power Unit

Performance proved in millions of hours of service on countless types of jobs. Four-cylinder, L-head, completely enclosed in all-weather housing. Delivers 25 h.p. at 1800 r.p.m. on natural gas. Write for special folder PF-47-162.

In writing for free bulletin, kindly mention application for which power is required.



UNIBESTOS

pipe covering insulation at modern, natural-gasoline plant in Keystone field of West Texas

Photo: courtesy of Sid Richardson Company, Texas.
Insulation Contractor, The Aber Company, Shreveport, La. and Houston, Texas.

UNIBESTOS No. 750 is suitable for temperatures up to 750° F. No. 1200 or Combination are recommended for temperatures up to 1200° F. These temperature ranges permit the use of one material at maximum efficiency for a wide variety of purposes. Unibestos is available in half-sections up to 30" pipe diameter, in quadrants up to 60" diameter, and in cylindrical form where specified. UNIBESTOS No. 750, No. 1200, and Combination are all furnished in single-layer constuction.

UNIBESTOS ASSURES SUBSTANTIAL SAVINGS IN TIME AND MONEY because of its high structural strength, long life and ease of removal and reapplication without loss of efficiency.

Top efficiency over a wide range of operating conditions . . . shock and vibration resistant pipe covering in single-layer construction that is extremely easy to cut, strip and apply . . . high physical and chemical stability . . . **THESE ARE JUST A FEW OF THE REASONS WHY SO MANY GIANT REFINERIES SPECIFY UNIBESTOS INSULATION.** Write today for complete data, the coupon below, is for your convenience.

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UNION ASBESTOS & RUBBER COMPANY
1811 South 54th Avenue, Cicero 50, Illinois

December, 1949

Gentlemen:
Please send sample ☐ and/or illustrated folder ☐ showing sizes, prices, conductivity curves and technical information to

Company.....

Address.....

Name..... Title.....

This Simple Compressor Meets the Complex Needs of a Changing Petroleum Industry

It's the Nash!

Here is a compressor presenting advantages found in no other device. Nash Compressors have only one moving part, rotating without metallic contact with the pump casing. No internal lubrication is required. Yet they produce 75 lbs. pressure in a single stage, with capacities to 6 million cu. ft. per day in a single structure.

There are no valves, gears, pistons, sliding vanes, or other complicated wearing parts in a Nash. Compression is secured by an entirely different principle of operation. Because of this, gas pumping problems difficult with ordinary pumps are often easily handled by the Nash. For example, Nash Pumps are standard equipment in the Synthetic Rubber Industry, where they have met the needs of new and difficult processes.

Nash Compressors are compact and save space. They run without vibration, and compression is without pulsation. They maintain original performance over long periods. Service is assured by a nationwide net-work of Engineering Service offices. Instructive bulletin shows how they operate. Write for it.

One moving part.

No internal wearing parts.

No valves, pistons, or sliding vanes.

No internal lubrication.

Low maintenance.

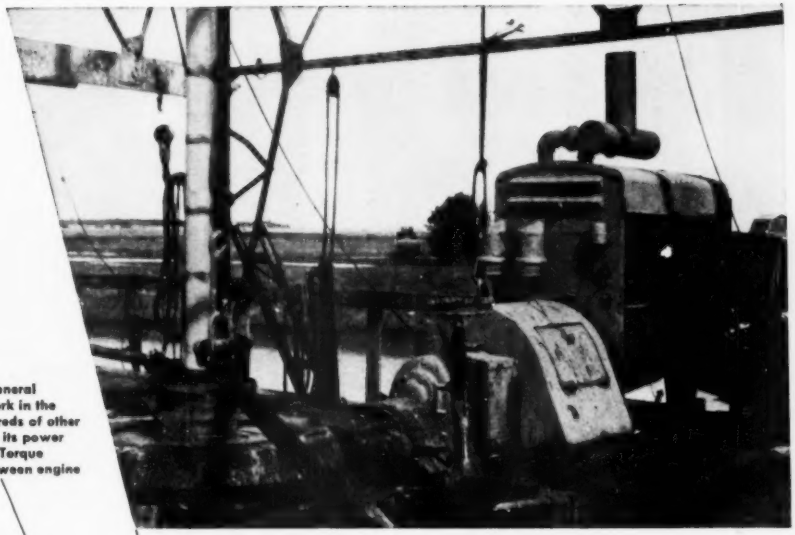
Slugs of liquid entering pump do no harm.

Non-pulsating pressure.

Saves floor space.

75 pounds in a single stage.

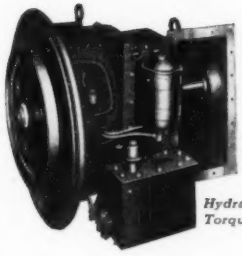
NASH ENGINEERING COMPANY
273 WILSON, SO. NORWALK, CONN.



This drilling rig, operated by General Petroleum, Ltd., is shown at work in the Leduc Field, Alberta. Like hundreds of other Canadian drilling rigs, it drives its power through a Twin Disc Hydraulic Torque Converter (shown at center, between engine and rotary table).

Protect Your Rig

FROM THE UNEXPECTED



Hydraulic Torque Converter

A Twin Disc Torque Converter is like an insurance policy. It protects your rig from the unexpected. It is a *fluid* link between your engine and drill that cushions destructive shocks. When your bit hits rock, the sudden wrenching force is absorbed in the torque converter before it can stall or damage your engine.

There's no gearshift guesswork in a drilling rig that drives through a Twin Disc Torque Converter (Lysholm-Smith type). The right torque for any bit or hoisting load is selected *automatically and instantly*. You get a steady, smooth flow of power at all speeds and your engine can run at its most efficient speed regardless of load demand.

Ask your nearest dealer to show you what the Twin Disc Hydraulic Torque Converter can do for *your* drilling rig, or write direct for Bulletin No. 135-C.

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin
(Hydraulic Division, Rockford, Illinois).

CANADIAN REPRESENTATIVES

Precision Machine & Foundry, Ltd., Edmonton, Alberta
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Wilson Equipment Co., Ltd., Vancouver, B. C.

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stand out
as the kind that
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their accuracy.

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Offshore rigs last longer with "CORO-GARD" Anti-Corrosion Coatings

BEFORE. Only 8 months of normal exposure to salt water spray and immersion caused this conventional coating to fail. Another application will be necessary at once, in order to prevent extreme damage to rig framework and equipment. A costly job that can be avoided.

AFTER. Protective coating of "Coro-Gard" being applied to offshore drilling platform substructures and capbeams. Careful compounding of this synthetic coating guards vulnerable metal against brine, high humidity, petroleum impurities, many other corrosive agents—gives long protection.

Durable Coating Systems Cut Maintenance Costs

Here's another large oil company that's saving money with "Coro-Gard" Protective Coatings! Service life of offshore drill rigs has been extended thanks to more complete protection against salt water, high humidity and abrasion.

There are 15 basic "Coro-Gard" Coating Systems, each designed for specific service conditions. There's one to meet *your* corrosion or abrasion problem.

WRITE FOR FREE advice on metal conservation problems. Our engineering service will be glad to suggest the proper "Coro-Gard" Coatings. No obligation. Address: Minnesota Mining & Mfg. Co., Adhesives and Coatings Div., 411 Piquette Ave., Detroit 2, Mich.

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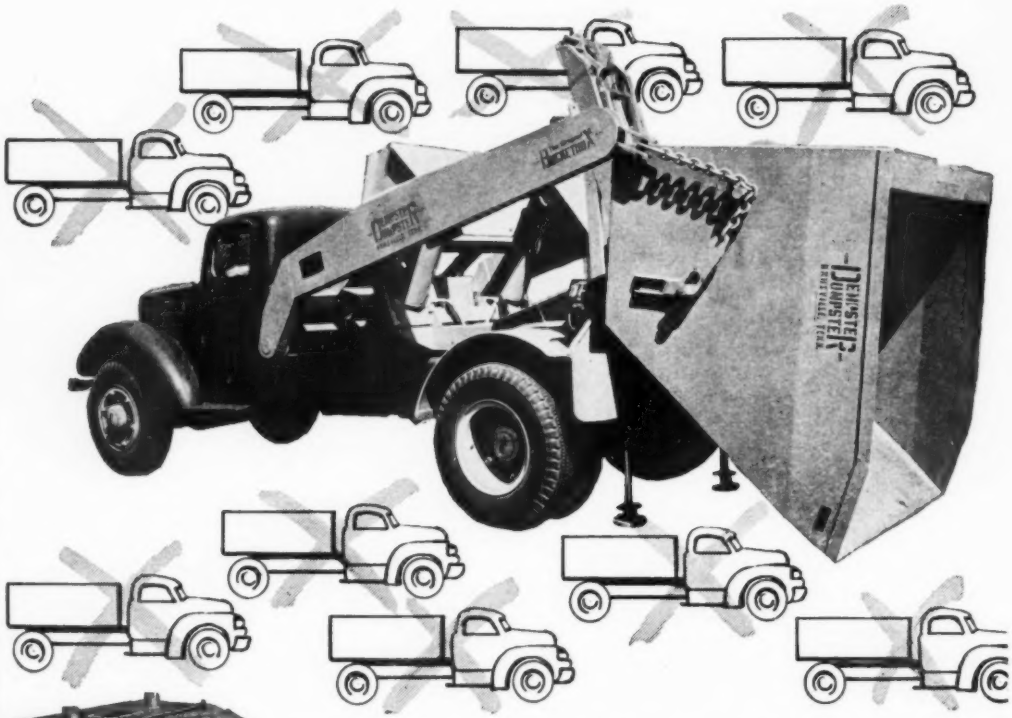
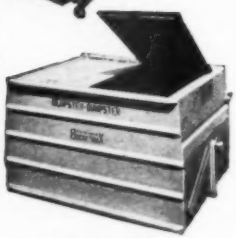




WOULD YOU WRITE A LETTER FOR FIFTY THOUSAND DOLLARS?

A simple reply to one of our advertisements . . . a meeting of probing minds over the problems involved . . . the replacing of ten conventional trucks with only one Dempster-Dumpster truck unit and 99 containers . . . fifty thousand dollars annual savings for this one firm.

That, briefly, was the result of a simple inquiry for information about the Dempster-Dumpster System of materials handling.

A comprehensive Dempster-Dumpster survey revealed costly delays, unnecessary handling of materials, and much time wasted by loading crews. All were eliminated to the tune of $50,000 savings annually. Fast pick-up, hauling and dumping of pre-loaded Dempster-Dumpster containers replaced the old method of plant hauling. Ninety-nine detachable containers, built in over 20 sizes and designs for the specific materials they handle, were spotted at material accumulation points. Some are handled by fork trucks, others by overhead cranes within plant buildings. As containers are filled, the Dempster-Dumpster truck hoisting unit and one man, the driver, picks up each container, hauls it to its destination, dumps it and returns the empty container for refilling.

Pick-up and dumping of these detachable containers takes less than 60 seconds. The entire operation works to an on-the-run schedule. One truck hoisting unit handling 99 containers and doing the work formerly requiring ten conventional trucks. Let us bring you the complete details of the Dempster-Dumpster System.

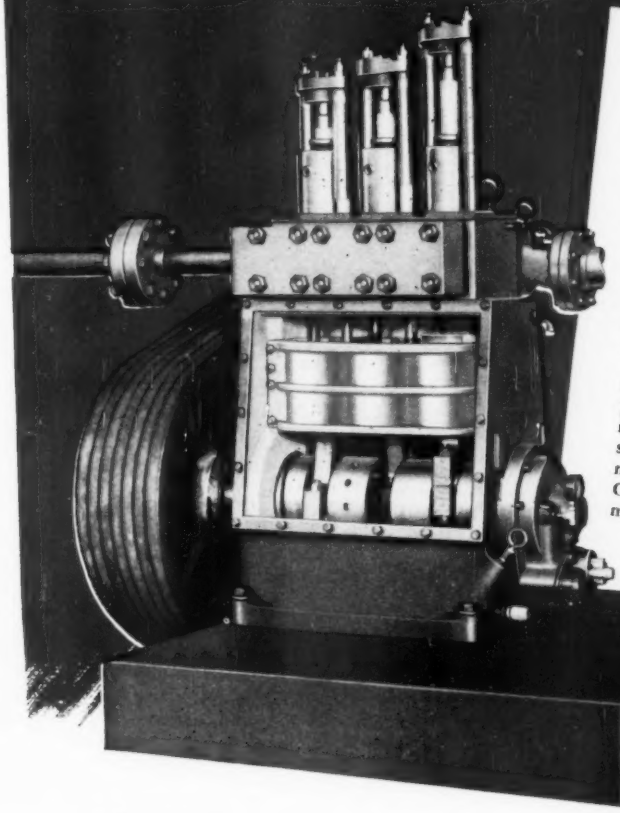
Containers, in standard and special types, in capacities from 1½ to 10 cu. yds. are available. Whatever your materials are, be they heavy, light, bulky, dust, liquid, waste, raw or finished, you'll find a Dempster-Dumpster container ready, or custom built, to do the job more efficiently.

DEMPSTER DUMPSTER
TRADE MARK REG.
SYSTEM

DEMPSTER BROTHERS, Inc., 5129 Dempster Bldg., Knoxville 17, Tennessee

IT'S NEW!

Aldrich 5" Stroke Direct Flow Pump Series



New in design, the Aldrich 5" Stroke Direct Flow Pump features, besides many distinct advantages, a *new low in price.* Built in standard Aldrich series with 3, 5, 7 or 9 cylinders, these pumps range from 100 to 275 hp and handle almost all liquids encountered in oil field and petroleum service.

The fluid-end on the new 5" series consists of a *sectionalized* assembly—of distinct advantage in handling corrosive liquids. When necessary, specific sections can easily be replaced—*at a fraction of the cost of an entire end unit.* Design of this fluid-end permits easy maintenance and interchangeable plunger sizes—without removing stuffing box liners. Throughout this 5" series all wearing parts other than main bearings are interchangeable. Close clearances provide high volumetric efficiency in handling light as well as heavy liquids.

Here is a pump, at a new low in price, designed for economy, reliability, accessibility and low maintenance. Send for Data and Specification Sheets for full details on how a new Aldrich 5" Stroke Direct Flow Pump can assure you *better* service and *improved* economy. Write today:

Representatives: Birmingham • Bolivar, N. Y. Boston • Chicago • Cincinnati • Cleveland Denver • Detroit • Duluth • Houston Jacksonville • Los Angeles • New York • Omaha Philadelphia • Pittsburgh • Portland, Ore. Richmond, Va. • St. Louis • San Francisco Seattle • Spokane, Wash. • Syracuse • Tulsa

THE ALDRICH PUMP COMPANY

9 GORDON STREET, ALLENTOWN, PENNSYLVANIA

All Aldrich Pumps Have **STAYING POWER**

POUNDS OR TONS — AS HANDY AS YOUR TELEPHONE

ONE CALL SERVICE FOR ON-CALL METALS

To supply the specialized needs of the petroleum industry for corrosion-resistant stainless steels and stainless steel products, your Metal Goods warehouse carries a large stock of these essential specialty metals. Many different grades and types can now be furnished from stock—without delay. A few of these are:

***Type 316* for higher corrosion resistance under reducing conditions.**
***Types 321 and 347* for welding applications.**
***Type 410* in strip and sheet for vessel linings.**

Sheets • Plates • Bars • Tubes • Castings • Fittings

We also stock the accessories you'll need to complete your job:
Welding Rod • Nuts • Bolts • Studs • Rivets, etc.

Types for special applications, although not normally stocked in warehouses, can also be supplied by us at no extra cost.

Metal Goods warehouses are strategically located in the heart of the Midwest and Gulf Coast refining industry — ready to serve you quickly and dependably.

Monel® • Nickel® • Inconel® • Aluminum • Brass • Copper

Plus complete stocks of condenser and heat exchanger tubes... Admiralty... Alclad Aluminum... 70/30 Super-Nickel... Monel.

Tube Sheets... Naval Brass... Muntz Metal

Not Warehoused in Kansas City or St. Louis **Fittings and Accessories**

Consult your Metal Goods metallurgical specialist on the proper metal for your application. *Phone, wire or write your Metal Goods warehouse for your specialized metal needs. Do you have your "Metalog"? It's a complete stock list and metal manual. Write for it!*

MGC

OFFICES AND WAREHOUSES:

METAL GOODS CORPORATION

St. Louis, 5250 Brown Ave. • Houston, 711 Milby St. • Tulsa, 302 N. Boston • New Orleans, 432 Julia St. • Dallas, 6211 Cedar Springs Rd. • Denver, 817 17th St. • Kansas City, 1300 Burlington

LIGHTNING PRODUCES FERTILIZER, TOO

Nature's fireworks—by transforming the inert nitrogen in the air to nitric acid — produce much more fertilizer per year than do Chemico-built plants. But lightning scatters its benefits without consideration for those who need them. Chemico-built plants, on the other hand, produce the kind of commercial fertilizer you want . . . where you want it . . . when you want it . . . in the concentration you want . . . at a very reasonable price.

Chemico offers a complete engineering and contracting service to the fertilizer industry, ranging from the design and construction of complete fertilizer works to furnishing small individual units and auxiliary plants of a specialized nature. From Pittsburgh to Pakistan, from Colombia to China, Chemico has been building such plants since 1914. Chemico brings to each new project a wealth of experience, proven methods and guaranteed performance.

If your plans include the production of nitrates, superphosphates, double superphosphates, ammonium phosphates, mixed salts or any other commercial fertilizers, it will pay you to discuss your specific problems with Chemico.

CHEMICAL CONSTRUCTION CORPORATION

EMPIRE STATE BLDG., 350 FIFTH AVENUE, NEW YORK 1, N. Y.

EUROPEAN TECHNICAL REPRESENTATIVE
CYANAMID PRODUCTS LTD., BRETTENHAM HOUSE, LANCASTER PLACE, LONDON W. C. 2, ENGLAND
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CC-190

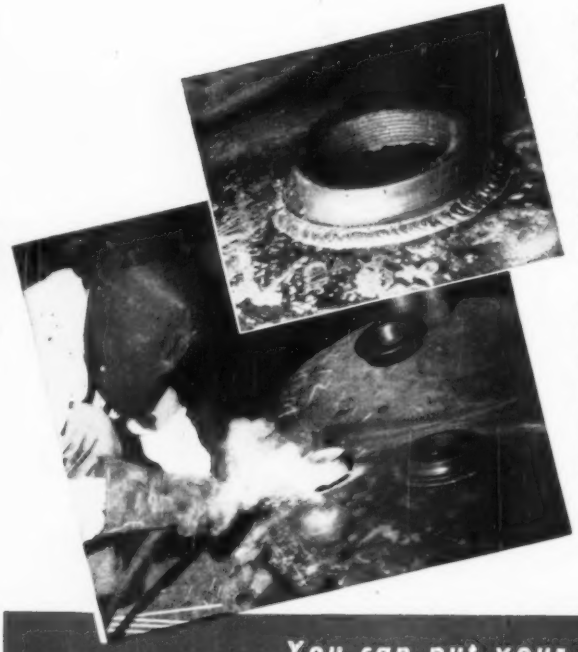
CABLES: CHEMICONST, NEW YORK

CHEMICO
CHEMICAL CONSTRUCTION CORP.

Chemico plants are profitable investments

ARC-WELDING FREE

FIRST sample our improved Class E-6010 electrode



G.E.'s NEW W-22 ELECTRODE (AWS Class E6010) is a reverse polarity d-c rod that produces high-quality welds in *all* positions. Its steady, spray-type arc is easily controlled . . . with little spatter, and excellent penetration.

This electrode is ideal for vertical and overhead welding jobs where welds of excellent appearance, high tensile strength, high ductility, and good impact resistance are particularly important.

The new W-22 has already proved itself in production tests . . . such as that at the Vulcan Steel Tank Company at Tulsa, where it was used in welding tank heads or end covers 36" in diameter and ¼" thick. Note the good fusion and excellent appearance of the finished welds. Their Welding Superintendent reports this electrode has the most forceful yet easily controlled arc he has ever seen.

You can put your confidence in

GENERAL ELECTRIC

733-2

ELECTRODES

combination offer

SECOND ...new G-E welding electrode comparator

Here's all the electrode comparison information heretofore available only on large, unwieldy charts—condensed into a handy, pocket-sized slide-rule. Naturally, it includes all G-E electrodes—mild-steel, special alloys, low-hydrogen, stainless-steel, hard-surfacing, etc.; and it covers the standard electrodes of all principal manufacturers—all suitably keyed to AWS classification numbers. And it's easy to use . . . just set the rule, and read off the comparison data directly. You'll find it the handiest means of comparing electrodes you've ever come across.

Clip the coupon for your free copy of the new G-E welding electrode "Comparator."

And here's a special bonus! Mail the coupon today, and we'll also send you a copy of the brand new edition of the pocket-sized G-E Arc-welding Electrode Catalog!

ARC WELDERS
ELECTRODES
ACCESSORIES • RENEWAL PARTS

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MAIL TO YOUR G-E WELDING DISTRIBUTOR

. . . or to Sect. F712-2, Apparatus Department, General Electric Co., Schenectady 5, N. Y.

Send me the following:

( ) Free sample of W-22 electrodes

( ) Welding Electrode Comparator slide rule

. . . and a copy of new electrode catalog, GEC-482

Name .....

Company .....

Address .....

City ..... **State** .....

You *specify* the service . . . We'll *supply* the RIGHT valve

This may sound like a broad statement, but we can prove it. Because of the completeness of the Powell Line, we are always able to supply the *right* valves to meet the requirements of every industrial flow control service.

You specify the conditions under which the valve must operate. Usually your Powell distributor will know which is the right Powell Valve to meet them. If the conditions present a problem he can always consult Powell Engineers, or if you prefer, write to us direct.

At all events be sure you install the *right* valves—it's easy to do with the Powell Line.* Failure to do so will mean faulty performance instead of the long, trouble-free operation you can expect from the right Powell Valves.

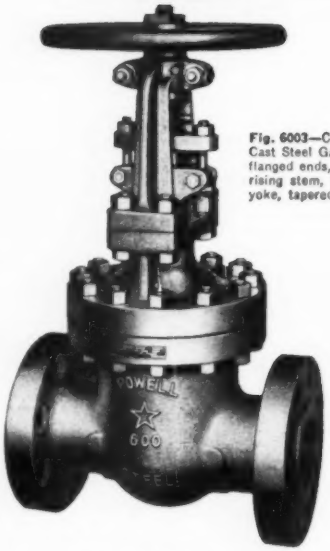


Fig. 6003—Class 600-pound Cast Steel Gate Valve with flanged ends, outside screw rising stem, bolted flanged yoke, tapered solid wedge.

Fig. 1708—200-pound Bronze Globe Valve with screwed ends, union bonnet, renewable, specially heat treated stainless steel seat and regrindable, renewable, wear-resisting "Powellium nickel-bronze disc.

Fig. 375—200-pound Bronze Gate Valve. Screwed ends, union bonnet, inside screw rising stem and renewable "Powellium" wear-resisting nickel-bronze disc.

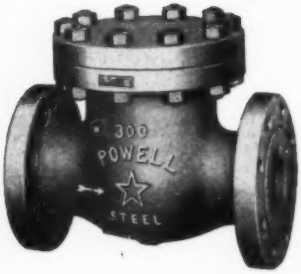


Fig. 3061—Class 300-pound Cast Steel Swing Check Valve with flanged ends and bolted cap. Disc has ample lift to permit full, straightway, unobstructed flow through the valve body.

Fig. 1793—Large 125-pound Iron Body Bronze Mounted Gate Valve. Made in sizes 2" to 30", incl. Has outside screw rising stem, bolted flanged yoke, tapered solid wedge.

***The Complete Powell Line includes Globe, Angle, Gate, Check, Relief and Flush Bottom Tank Valves in Bronze, Iron, Steel and a wide range of Corrosion-Resisting metals and alloys.**

Ask your nearest Distributor—or write direct

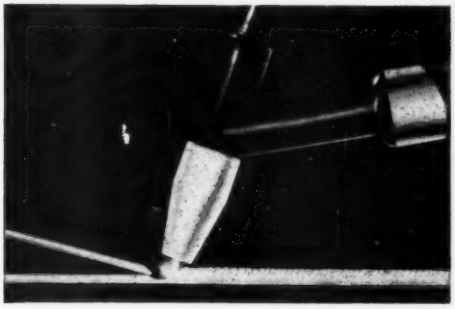
The Wm. Powell Co., Cincinnati 22, Ohio

DISTRIBUTORS AND STOCKS IN ALL PRINCIPAL CITIES

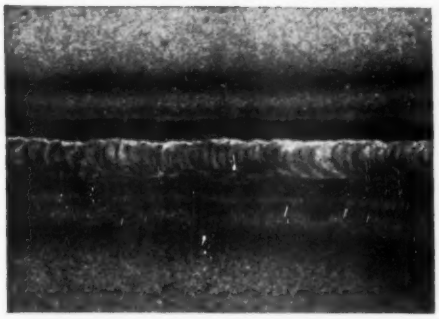
POWELL VALVES

Weld Sheet Steel with the HELIARC torch

Trade-Mark



and wipe out one complete operation



AS WELDED — *This photograph, unretouched and natural size, shows that* HELIARC *welds in sheet steel are clean and uniform.*

There is no spatter or flux, so you save cleaning costs when you switch to the HELIARC process for welding sheet steel. And you keep the advantages of high speed, and minimum distortion that are characteristic of arc welding. Any manual arc or gas welding operator finds welding with a HELIARC torch easy to master.

Porosity-free welds in killed low-carbon steel up to ⅛ in. thick can be made with this process. In non-killed grades, welds are as nearly gas free as can be produced by any welding process. Argon-shielding prevents pick-up of atmospheric gases. No argon is dissolved in the weld.

Joints welded with the HELIARC torch will not show under paint, lacquer, or even vitreous enamel finish. It takes only a light grinding to remove the low, smooth ripple and make the bead flush with the surface.

Get more information on this fast, clean, welding process from any LINDE office. Let us show you how it can improve your product and cut your costs. Just fill in the coupon.

The terms "Linde" and "Heliarc" are registered trade-marks of The Linde Air Products Company.

THE LINDE AIR PRODUCTS COMPANY
Unit of Union Carbide and Carbon Corporation
30 East 42nd Street New York 17, N. Y.
Offices in Other Principal Cities
In Canada:
DOMINION OXYGEN COMPANY, LIMITED, Toronto

THE LINDE AIR PRODUCTS COMPANY
30 East 42nd Street, New York 17, N. Y.
(or your nearest LINDE office)

Gentlemen: We would like more information on welding sheet steel with the HELIARC torch. We manufacture ..... (Product)
from ..... (Metal) of ..... (Thickness)
We are ☐ (are not ☐) now using inert gas-shielded welding

Name.....Position.....

Company.....

City.....State.....

At Gulf Oil Corporation's Spear Gasoline Plant, Kilgore, Texas, liquid propane is pumped directly into storage tanks. While awaiting shipment, only free water is drained off. Then the propane is dehydrated on its way to the tank cars.

The dehydrator, through which the propane is pumped, consists of a single tower containing 2,500 pounds of Alcoa Activated Alumina. The operating pressure is approximately 180 psig, inlet temperature averages 70°F. and the propane is dried to pass the cobalt-bromide test.

Although approximately 50,000 gallons of propane are pumped through this tower daily, reactivation of the Alcoa Activated Alumina is required only at 60-day intervals. This means that each pound of Activated Alumina dries 1,200 gallons of liquid propane.

The stability and sorptive capacity of Alcoa Activated Alumina eliminate the necessity of more frequent regeneration cycles. Although moisture is held for relatively long periods, the Alcoa Activated Alumina does not swell, soften or disintegrate.

It is one of the few solid types of adsorbents that does not change its form or properties. Being noncorrosive and inert, Alcoa Activated Alumina has no effect on the product even when the latter stands in contact with the alumina for long periods.

Whether operating conditions are normal or extreme, Alcoa Activated Alumina is one drying agent you can depend on for reliability and economy. Let us send you all the facts. Write to: Aluminum Company of America, Chemicals Division, 1967M Gulf Building, Pittsburgh 19, Pa.

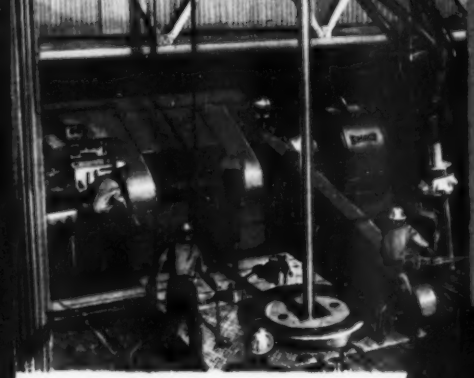
Gulf Oil Corporation depends on
ALCOA ACTIVATED ALUMINA
for drying propane at Spear Gasoline Plant

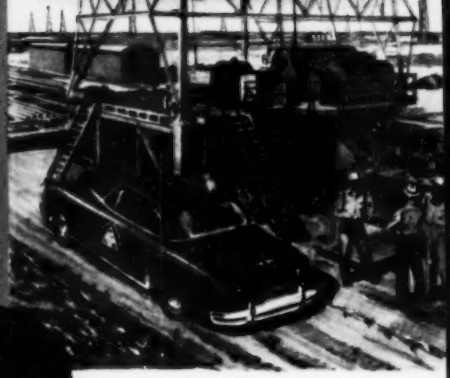
Single tower, dehydrating 50,000 gallons of propane daily, requires regeneration only at 60-day intervals.

This single tower, containing 2,500 lbs. of Alcoa Activated Alumina, dehydrates approximately 50,000 gal. of liquid propane daily—is regenerated at 60-day intervals.

ALCOA CHEMICALS
ALUMINAS AND FLUORIDES

ACTIVATED ALUMINAS • CALCINED ALUMINAS • LOW SODA ALUMINAS • TABULAR ALUMINAS • HYDRATED ALUMINAS
ALUMINUM FLUORIDE • SODIUM FLUORIDE • SODIUM ACID FLUORIDE • FLUOBORIC ACID • CRYOLITE





THESE

World-Famous Symbols

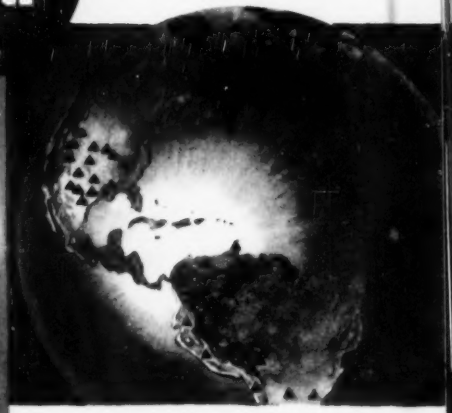
MEAN

UNSURPASSED PRODUCTS

UNEXCELLED SERVICE

EMSCO drilling equipment is world renowned as the finest oil field equipment money can buy. Rigs, rotaries, blocks, swivels, portable masts, derricks, etc., are engineered to provide a completely balanced drilling rig with horsepower ratings and tonnage capacities in harmonious balance for most efficient operation. All equipment is manufactured in a wide variety of sizes and types to meet all drilling requirements.

CONTINENTAL maintains thoroughly experienced sales and service personnel in all major oil fields. These men stand ready twenty-four hours a day, every day, to assist you in selecting quality equipment best suited for your particular needs. Comprehensive, illustrated service manuals further increase operating efficiency by providing field men with recommended operating and maintenance procedures.



EMSCO PRODUCTS

- GA Series Drilling Rigs
- J Series Drilling Rigs
- Steam Reservoirs
- Rotary Machines
- Swivels
- Crown and Traveling Blocks
- Derricks and Substructures
- Bolge Type Portable Masts
- Pumping Units
- D+B Deep Well Pumps
- D+B Sucker Rods
- D+B Rod Couplings

EMSCO—D+B production equipment represents the most advanced engineering design for this type of equipment. Pumping units are available in both standard and floor clearing types in sizes to meet all production requirements. D+B sucker rods combine precision workmanship, strict metallurgical control and highest quality materials to provide the finest sucker rods available at any price. D+B deep well pumps are manufactured in a wide variety of both rod and tubing types to provide highly efficient pumps for all pumping conditions.

THE "GREEN TRIANGLE" is a world famous trade mark wherever men drill for and produce oil. Continental maintains 70 field stores and offices, strategically located, in the domestic oil fields. Export representatives provide world-wide sales and service. Compare Emsco-D+B products, product by product, with any other manufacturer; then compare Continental service facilities with any other supply company, and you will see why for the best in products and the best in service you should depend upon the "Green Triangle."

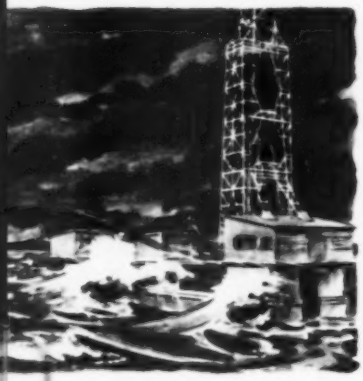
ADV. 39F-49

CONTINENTAL

THE CONTINENTAL SUPPLY COMPANY

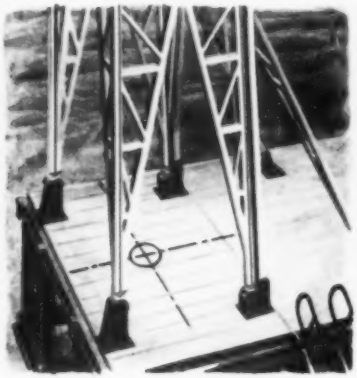
General Offices: DALLAS, TEXAS • Canada: The Continental Supply Co., Limited, 316 Lancaster Bldg., Calgary, Alberta. Export Division: The Continental Supply Company, Inc., 30 Rockefeller Plaza, New York, N. Y. Representatives: Argentina • Bolivia • Brazil • Chile • China • Colombia • England • Ecuador • Peru • Trinidad • Uruguay • Venezuela

Here's What Emsco's Exclusive Bulge Feature Means to You...



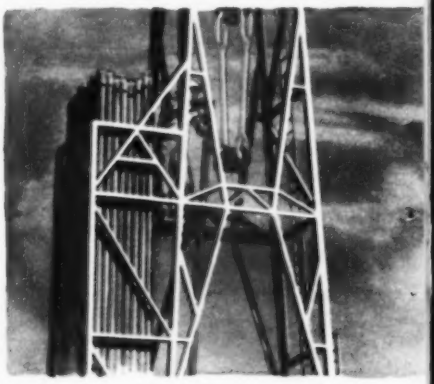
GREATER WIND RESISTANCE

All Emsco portable masts are designed to safely withstand *actual* wind velocities of 75 mph with full setback of pipe, or 100 mph on naked mast. This is nearly 3½ times the resistance to wind pressure as that of masts designed for 70 mph *indicated* wind velocity. These wind load capacities indicate the structural rigidity inherent only with the Emsco bulge design.



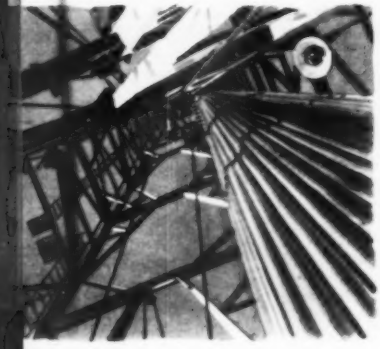
EQUAL LOADING OF ALL FOUR LEGS

The erection gin pole is not an essential part of Emsco bulge type portable masts. It is used only for raising and lowering operations. Emsco masts have equal loading of all four legs. This provides crown block capacities far in excess of those obtained with open face masts, of equivalent leg size, which depend upon erection gin pole for support of back legs.



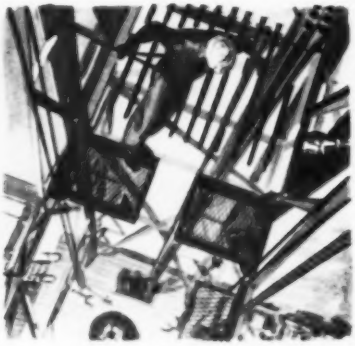
MORE RACKING CAPACITY

Emsco's exclusive bulge feature permits racking of more drill pipe than can be racked safely in any other type portable mast. Drill pipe inside bulge is racked and supported securely. Emsco Series 18, 136' masts may be equipped with one or two bulges. Two bulges permit simultaneous racking of both drill pipe and tubing on marine workover locations.



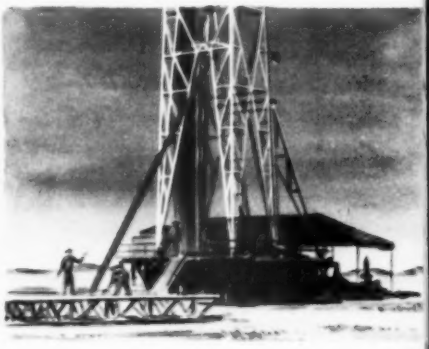
PERFECT VISIBILITY

All four faces of the mast are structurally laced together. No interior bracing is required. The absence of interior bracing coupled with racking of pipe entirely within the mast but outside the normal opening of the mast at the working platform level, provide unobstructed visibility for both driller and derrick man.



SAFE WORKING PLATFORM

Split-board type working platform insures maximum safety and affords unobstructed view of derrick floor. The derrick man, with one foot on each board, is placed squarely in front of the center line of the hole. This convenient position enables him to step to either board, or back onto the heavy fingers when handling pipe.



RUNNING CASING WITH PIPE IN BULGE

The exclusive bulge feature permits running casing with drill pipe in bulge. The "V" window is always open. The pipe rack is positioned to reduce torsional loading on mast to an absolute minimum. This is not true of open face masts where wind on racked pipe produces torsional stresses materially reducing load capacity of mast.

ONLY EMSCO BULGE TYPE PORTABLE MASTS OFFER ALL THESE OUTSTANDING ADVANTAGES

Emsco portable masts increase the efficiency, safety and portability of any drilling operation whether it be deep or shallow, on land or sea. See your nearest Emsco representative for complete information.

EMSCO

REG. U.S. PAT. OFF.

EMSCO DERRICK & EQUIPMENT COMPANY

Houston, Texas • LOS ANGELES, CALIFORNIA • Oakland, Texas

Distributors: Mid-Continent: THE CONTINENTAL SUPPLY COMPANY, Dallas, Texas
Canada: THE CONTINENTAL SUPPLY CO., LIMITED, Calgary, Alberta
Export: THE CONTINENTAL SUPPLY COMPANY, INC., New York, N. Y.

CHEMICAL FOAMITE FIREFOAM

IS THE MIGHTIEST WEAPON FOR FIGHTING GASOLINE FIRES

WITHOUT FOAMITE FIREFOAM SYSTEM PROTECTION, FIRE RAGES UNCONTROLLED
WITH FOAMITE FIREFOAM SYSTEM INSTALLED, FIRES IN STORAGE TANKS CAN BE READILY CONTROLLED

NO FIRE can survive a properly applied blanket of smothering Foamite Firefoam as continuously delivered by a fixed Foamite Generator System.

Oil storage tanks particularly need the protection of this flame-killing, fire-smothering Firefoam. Note the fixed Foamite Delivery Chamber in the illustration, ready to go.

The Foamite Foam Generator shown in the inset will produce up to 2200 gallons of Foamite Firefoam per minute. Other sizes also available. Write for full particulars.

Our 2nd Century of Leadership in FIRE PROTECTION

AMERICAN LAFRANCE FOAMITE *Corporation*

ELMIRA · NEW YORK · U·S·A

ALFCO

THIS BIG UP-DRAFT OIL HEATER

Fired with...

NATIONAL AIROIL OIL-GAS TANDEM COMBUSTION UNITS

This shows a large (U.O.P. designed) end-fired up-draft oil heater operating in a new Rocky Mountain refinery. This heater and the others in the same refinery are fired by "National Airoil" TANDEM COMBUSTION UNITS . . . which burn both oil and gas fuels to obtain uniform flame distribution without impingement on heat absorbing surfaces.

The TANDEM COMBUSTION UNIT is also designed for firing both fuels vertically upward. It has a high turn-down ratio with a steady flame . . . maintains a high flame temperature with either oil or gas fuels . . . can be brought quickly to full capacity with a clean flame.

Write for details about the TANDEM COMBUSTION UNIT and the various types available.

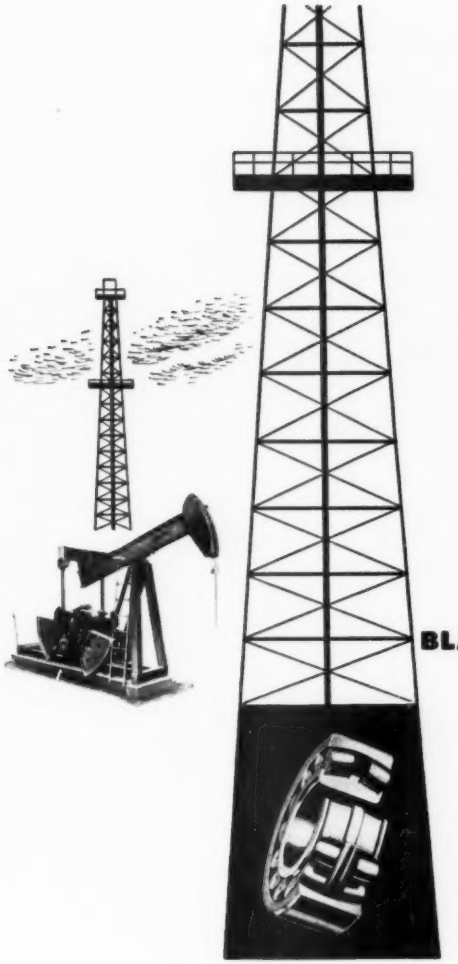
OIL BURNERS and **GAS BURNERS** for industrial power, process and heating purposes; **STEAM ATOMIZING OIL BURNERS; MOTOR-DRIVEN ROTARY OIL BURNERS; MECHANICAL PRESSURE ATOMIZING OIL BURNERS; LOW AIR PRESSURE OIL BURNERS; GAS BURNERS; COMBINATION GAS and OIL BURNERS; AUTOMATIC OIL BURNERS,** for small process furnaces and heating plants; **FUEL OIL HEATERS; FUEL OIL PUMPING and HEATING UNITS; FURNACE RELIEF DOORS; AIR INTAKE DOORS; OBSERVATION PORTS; SPECIAL REFRACTORY SHAPES.**

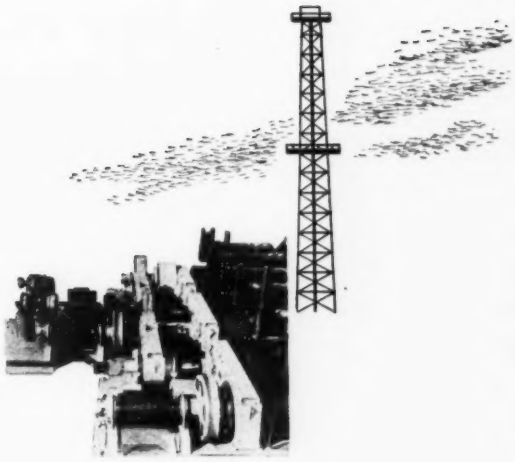
NATIONAL AIROIL BURNER CO., INC.

Main Offices & Factory: **1236 EAST SEDGLEY AVENUE, PHILADELPHIA 34, PA.**

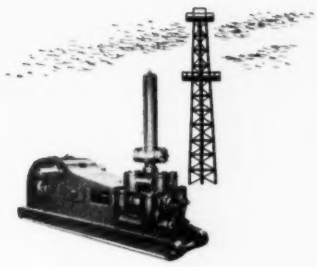
Southwestern Division: 2512 South Boulevard, Houston 6, Texas

INDUSTRIAL OIL BURNERS, GAS BURNERS, FURNACE EQUIPMENT





BLACK GOLD "MINED" ON SKF BEARINGS



Day-in, day-out oil field equipment takes rugged punishment, yet these industrial units continue to run efficiently. That's where SKF Spherical Roller Bearings play an important part. These bearings are designed and manufactured to withstand the severest operation.

Here's where and why SKF Bearings are specified:

Draw Works: SKF Spherical Roller Bearings give greater efficiency and economy because they provide for misalignment resulting from warpage where a built-up construction is used.

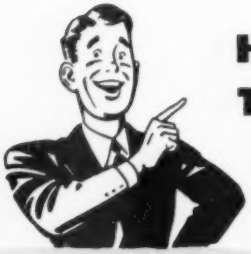
Compound Drives and Transmissions: SKF Bearings accurately locate the various shafts . . . the self-aligning features of the bearing eliminate binding.

Rotary Tables: The bevel helical gears on pinion shafts call for accurate locating under heavy radial and thrusts loads. SKF Bearings do the job.

Mud Pumps, Shale Shaker Screens, Prospecting Rigs, Well Servicing Winches, Cementing Rigs and Oil Pumping Units . . . all require a bearing that can take it. And SKF Spherical Roller Bearings are preferred by designers. There's an SKF to meet every requirement. Call in our engineers. SKF Industries, Inc., Philadelphia 32, Pa.

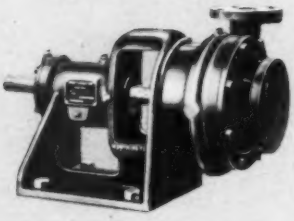
6628

Oil Field Equipment Bearings engineered by SKF

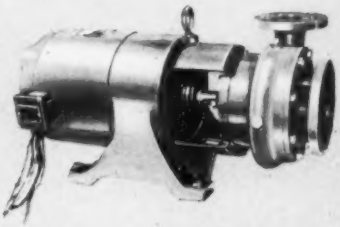


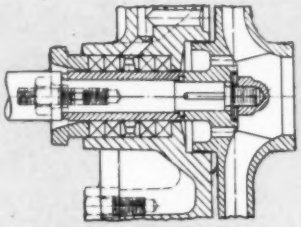
HERE'S PUMP-ENGINEERING THAT SAVES YOU MONEY!

Worthington Adapts The Same Basic Design To Different Needs

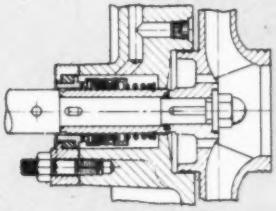


Worthington Centrifugal Pumps, Types CNE (frame-mounted) and DNE (Monobloc). Available in 36 sizes; capacities, 10 to 2,000 gpm; pressures 10 to 500 ft.





Conventional Packing



Mechanical Seal

FAVORITES in a wide range of oil industry uses, from the handling of fuel oil in bulk plants, trucks, and tank cars to circulating water for cooling engine-type compressors, these two Worthington Centrifugal Pumps are hydraulically identical. Type CNE, a frame-mounted pump, can be driven by electric motor or any other mechanical power-source. Type DNE is of balanced, compact Monobloc design with built-in explosion-proof motor, so essential in many petroleum applications.

The two types are so constructed that liquid ends are interchangeable, and packing can be either conventional or by mechanical seal. This is a two-way advantage: you can hook up the frame-mounted unit to your own power, or use the complete Monobloc unit. Whichever pump you select can be equipped either with a mechanical seal or conventional packing for gasoline, brine, caustic or water service.

THIS STANDARDIZING ON PUMP DESIGN is a Worthington specialty which results in streamlined manufacture, speedier delivery, more efficient, more economical pump performance and maintenance. How successfully it works out is shown by the vast numbers of Worthington Pumps now in use throughout the petroleum industry. Everywhere, every day, in oil fields and refineries, on pipe lines, loading and countless other duties you'll find these hard-working money-savers piling proof upon proof that *there's more worth in Worthington*. For further details, contact our nearest District Office or write to *Worthington Pump and Machinery Corporation, Centrifugal Pump Division, Harrison, N. J.*

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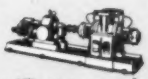
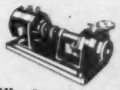
Types HR and HB. Twenty sizes. Capacities up to 1800 g.p.m. Developed heads up to 900 ft. Proper selection of material permits use for temperatures far below zero to 800°F., for pressures from high vacuum to 750 lb. per sq. in. gauge.

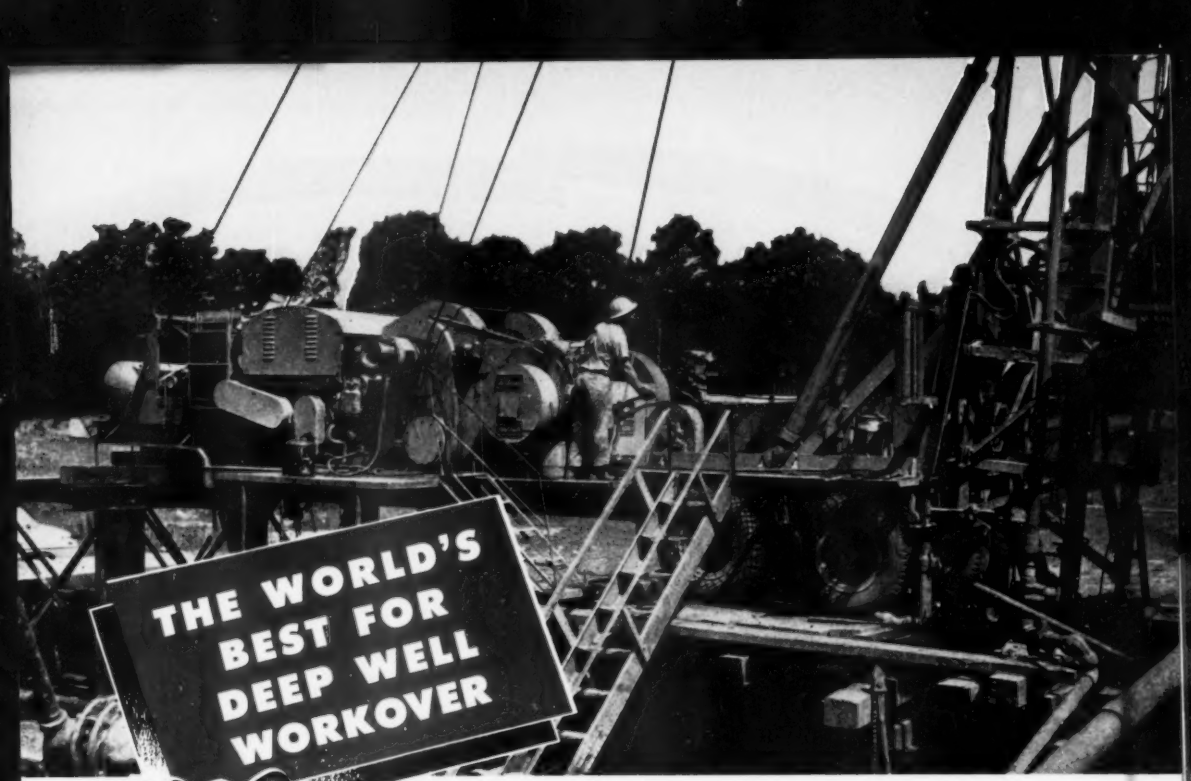


Type HD. Hydraulically-balanced, double-suction impeller handles boiling liquids with low submergence. Capacities range from 600 to 3200 g.p.m. at heads up to 700 ft., temperatures up to 850°F., pressures up to 550 lb.

Type WH. High-pressure, high-temperature, centrifugal hot-charge pumps. Twelve distinct points of superiority, based on years of experience building pumps for high pressures and temperatures. Capacities to 2000 g.p.m., heads to 5000 ft.



Type HL. Several construction arrangements permit flexibility in application. Designed for temperatures up to 225°F., or higher with water-jacketed stuffing box. Capacities up to 1600 g.p.m., heads to 500 ft.

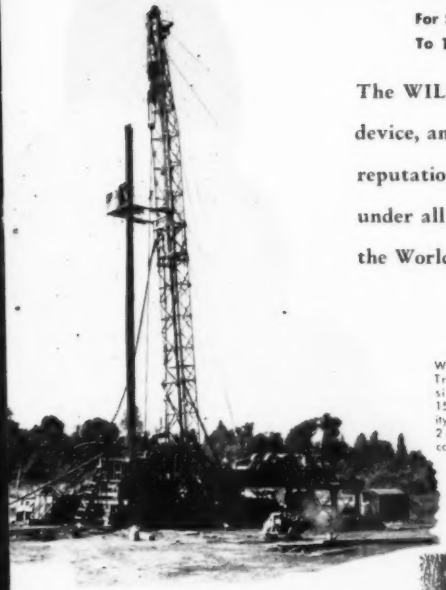


Wilson MOGUL TORCAIR WINCH

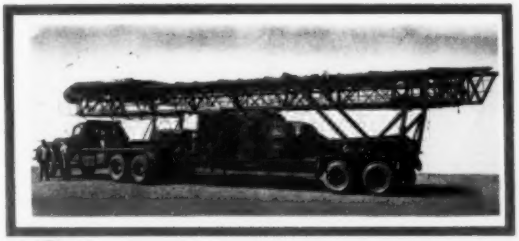
"YEARS AHEAD IN ENGINEERED EFFICIENCY!"

For Servicing Wells to 8,000 Feet with 2½" Tubing, Without Hydromatic Brake,
To 16,000 Feet with 2½" Tubing, with 15" Double Rotor Hydromatic Brake

The WILSON MOGUL TORCAIR WINCH is built to include every safety device, and designed for long, trouble-free life. The Wilson name and long reputation is your assurance of power to spare, with ruggedness to take it under all conditions. Particularly adapted to Portable Rig Operation–Truly the World's Best for Deep Well Workover!



Above: Mogul Torcair Winch owned by Lee and Markham Production Company, Gladewater, Texas. On location for Phillips Petroleum Company, near Tyler, Texas.



Mogul Torcair Winch with Mast on Trailer. Made in two sizes: 90-Ft. height, 158,000-pound capacity; and 90-Ft. height, 260,000-pound capacity.

Wilson MANUFACTURING CO., Inc.
WICHITA FALLS, TEXAS

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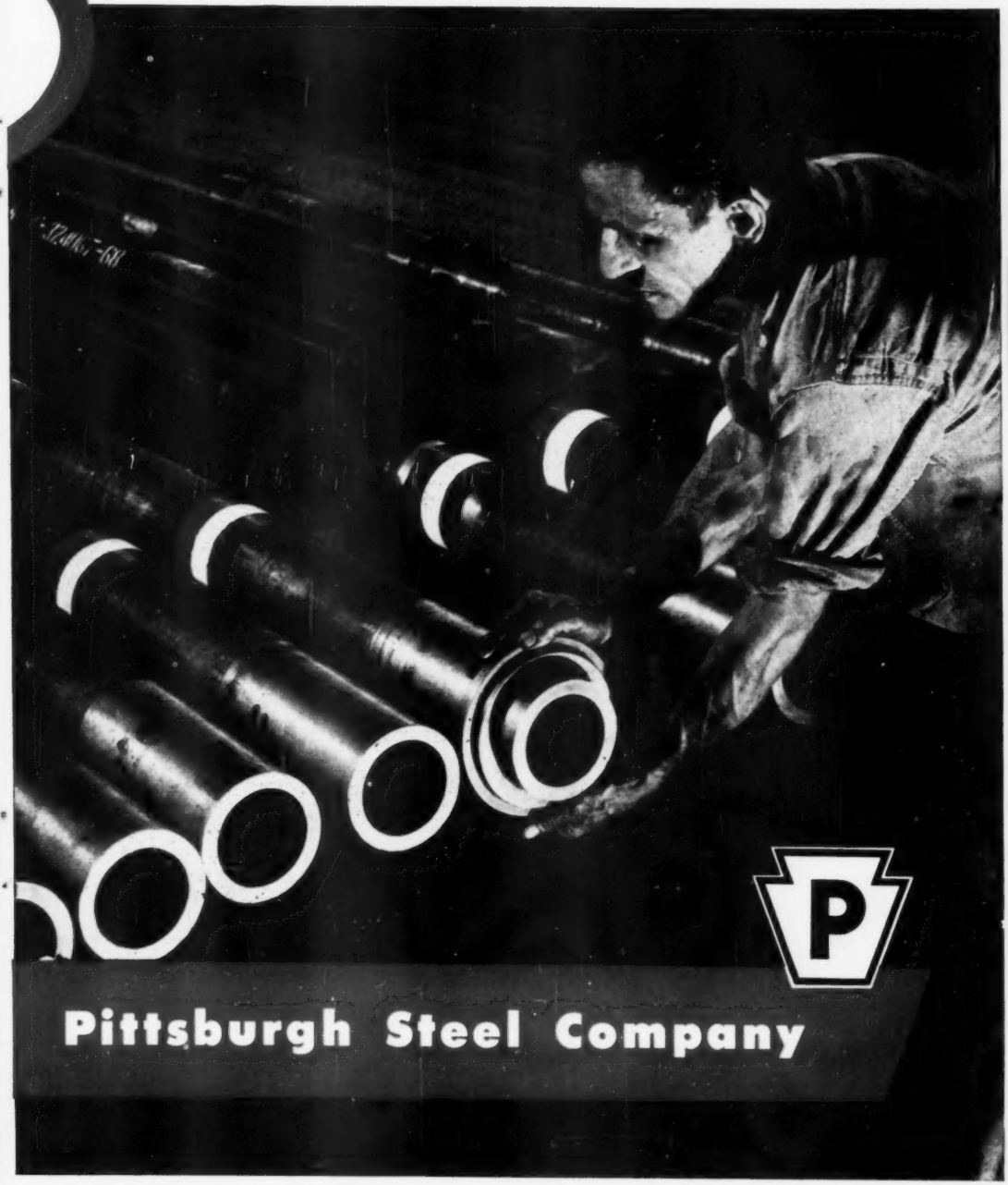
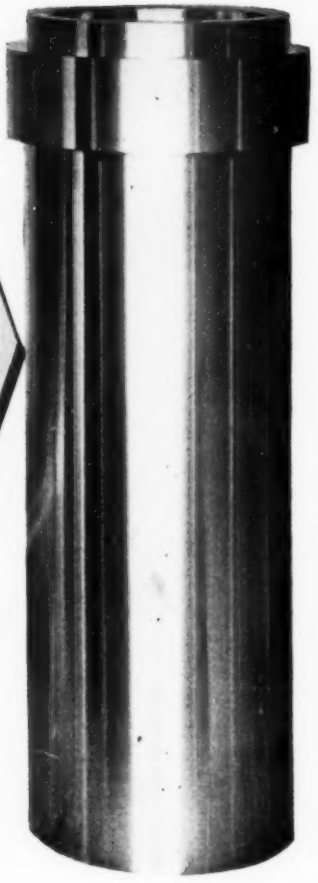
Mike Mazzei checking size accuracy of machined ends on Pittsburgh Still Tubes.



The extra life in "TOOL STEEL PROCESS" slush pump liners is equivalent to "stand-by" protection!



Compare these field records:

Fields	"Tool Steel" Liners	Competitive Hardened Liners
Illinois	67,228 ft.	14,231 ft.
Lindsay, Okla.	90 days (av.)	27 days (av.)
Chocolate Bayou, Texas	65,000 ft. (av.)	20,000 ft. (max.)
Texas Gulf	27,000 ft. (av.)	10,000 ft. (av.)
Leeville Field, La.	864 hours	240 hours (max.)
Blue Lake, Texas	40,000 ft. (still in service)	18,000 ft. (max.)

"Tool Steel" precision-made slush pump liners are producing 2 to 4½ times the footage of ordinary liners! This superior service life can be equalled by no other liners!

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M. T. (TOM) HARRELL, 1040 Marshall Street, Shreveport, La.

LYNN ELLIOTT COMPANY, 322 M & M Building, Houston 2, Texas

H. H. KUMLER COMPANY, 1642 East 3rd Street, Tulsa 6, Oklahoma

BUD BRANDEBERRY
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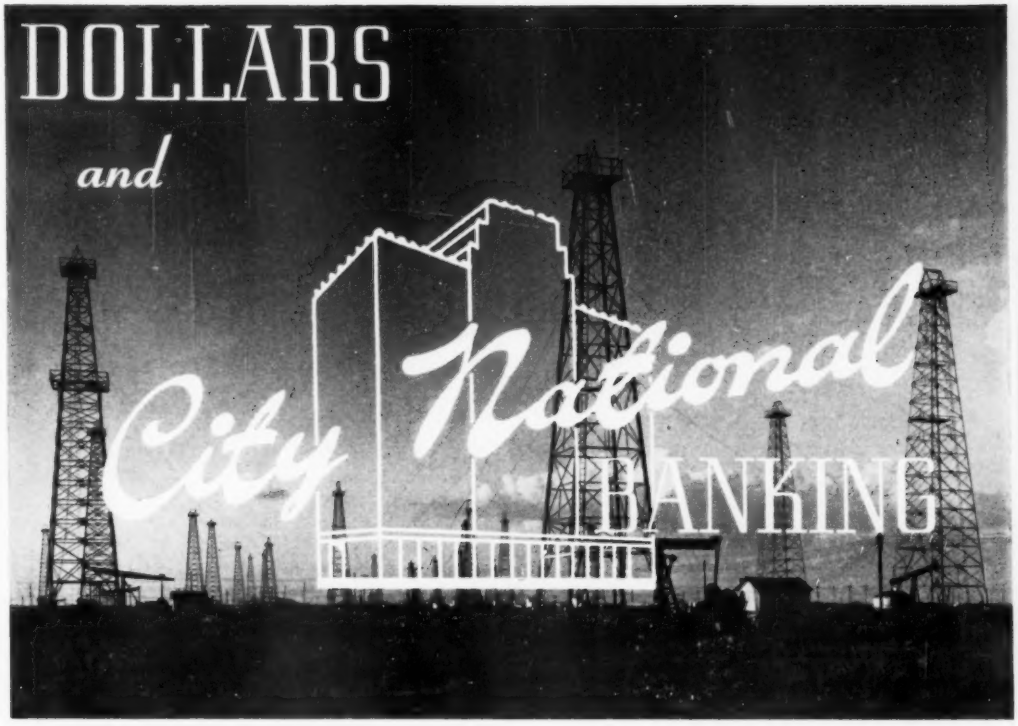
OIL FIELD EXPORT OFFICE, E. L. Carter 30 Rockefeller Plaza, New York 20, New York

THE TOOL STEEL GEAR & PINION CO.
CINCINNATI 16, OHIO, U. S. A.

DERRICKS



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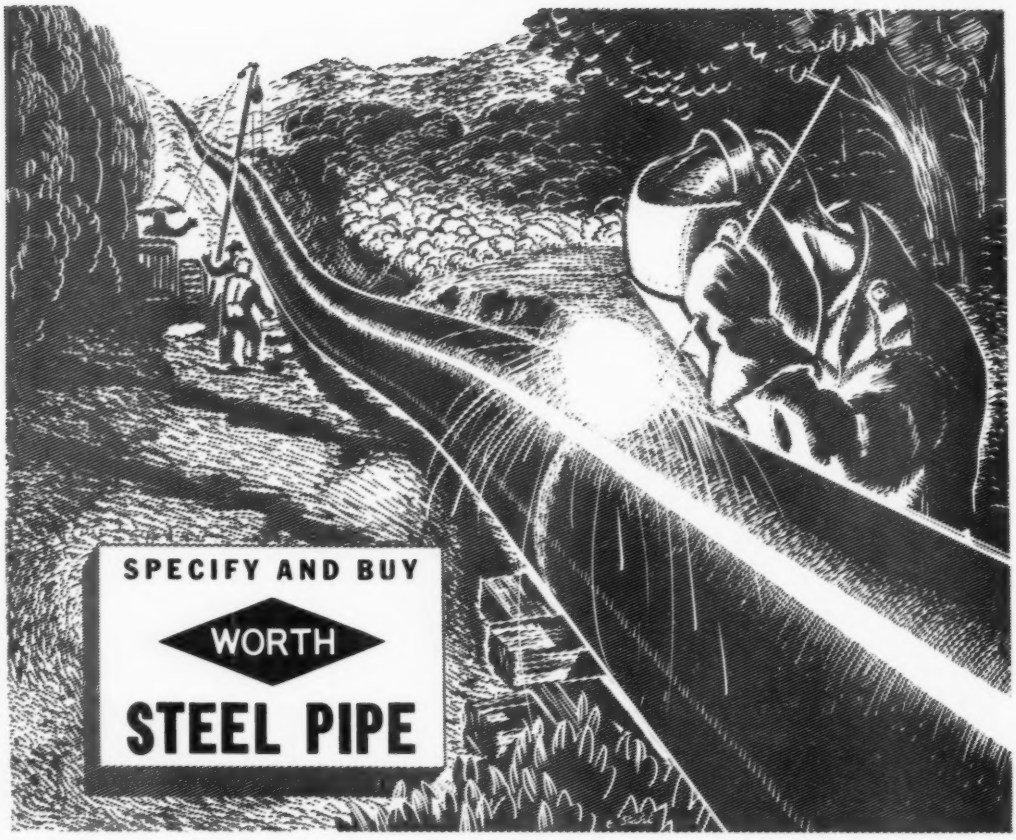
OF HOUSTON

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

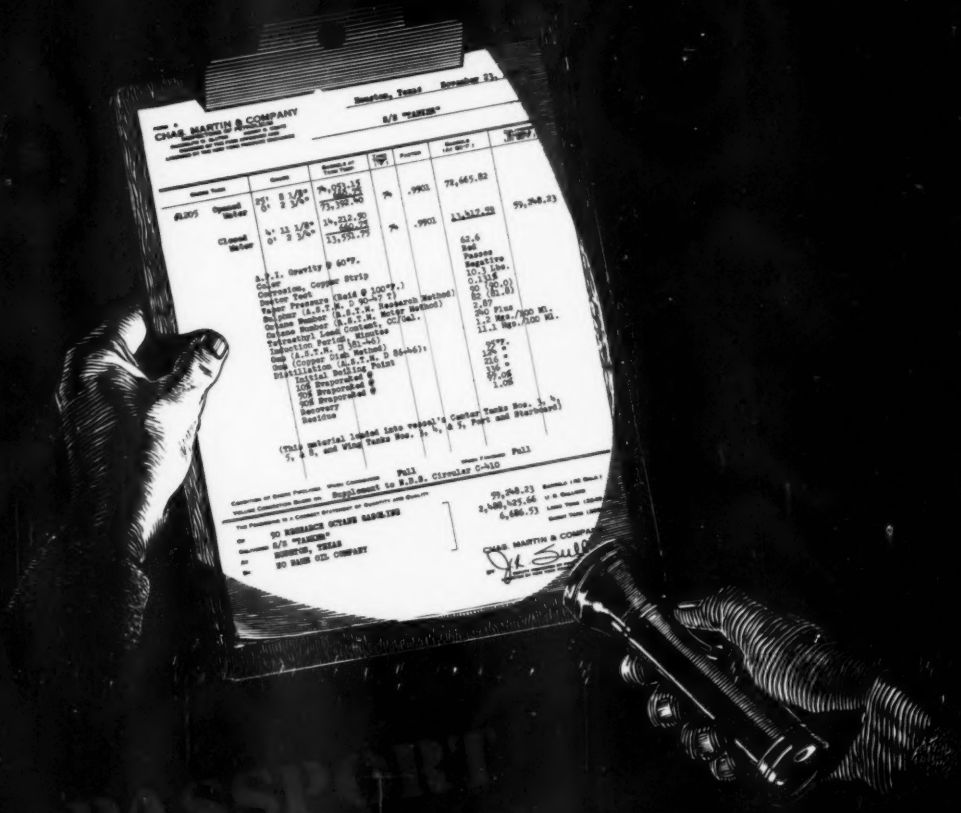


for EASE IN FITTING-UP AND WELDING

. . . fits together quickly and easily . . . because it is held to close tolerance dimension; fitting-up and welding, therefore, can be done faster. This is just one reason why many users of large diameter pipe specify Worth Fusion Welded Steel Pipe. Other advantages include: uniformity in gauge and quality . . . freedom from surface defects . . . is expanded . . . and available in 40′ lengths in 24″, 26″, 30″ and 36″ O.D. Reasonably prompt deliveries. Write for details.

ALSO PRODUCERS OF STEEL PLATES, CLAD STEELS and FLANGED and DISHED HEADS.

WORTH STEEL COMPANY · Claymont, Delaware



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All · Wheel · Drive

Big Trucks—and Small for Every Oil-Field Call

In the Marmon-Herrington line you will find an *All-Wheel-Drive* truck—*with the right power, in the right capacity*—to fit your oil-field needs exactly, however big or small.

Marmon-Herrington offers twenty-two *All-Wheel-Drive* models in all. Four are heavy-duty models of the company's own manufacture; the balance are standard Ford models converted to *All-Wheel-Drive* by Marmon-Herrington. Wheelbases range from 110 inches to 220 inches—gross vehicle weights from 5,300 pounds to 42,000 pounds. There are 7 great engines, Diesel and gasoline—from 4 to 10 forward speeds, 1 to 4 reverse.

Live power and traction in all wheels—*front wheels pulling, rear wheels pushing*—give Marmon-Herringtons tremendous tractive power for toughest off-the-road operations . . . no mud too deep, no hill too steep, no going too rough and rugged. Let your Marmon-Herrington dealer give you an on-the-job demonstration of these great *All-Wheel-Drive* trucks. You'll witness an eye-opening brand of performance-ability.

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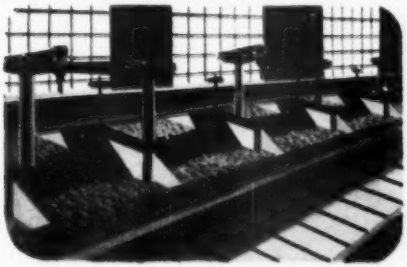
MAGCOBAR has just drilled a $1,000,000 MUDHOLE

New underground mining facilities will enable Magcobar to produce ore more efficiently... maintain lower mud costs... and better serve the oil industry for years to come!

From deep in the Magnet Cove mine, Magcobar starts to the oilfields on modern conveyor systems . . . . .



Then, beneficiated by Magcobar's own flotation process which produces material of exceptional purity . . . . .

Magcobar gives high weight, low viscosity muds that can be maintained at minimum cost while drilling.

Ten years ago, the producers of Magcobar were first to successfully develop the flotation process for beneficiating ore from the world's greatest barite deposit at Magnet Cove. Thus, Magcobar made available a plentiful supply of high-purity mud weight at low cost for today's deep, high pressure wells.

Mining of Magcobar has just begun from a new underground shaft which will materially benefit the oil industry. This "million dollar mud hole", even though it represents a major investment by Magcobar now . . . will enable us to economically mine ore from this great barite deposit for years to come. Thus, we can continue to serve the oil industry with an abundant supply of high quality mud weight at the fair and reasonable prices originated by the producers of Magcobar almost ten years ago. As a result of this Magcobar policy, the oil industry now saves more than four million dollars a year on their mud material purchases.

Look for the Magcobar sign when you need mud. More than 250 Magcobar dealers from Canada to Florida are ready to serve you night and day with complete drilling mud service.

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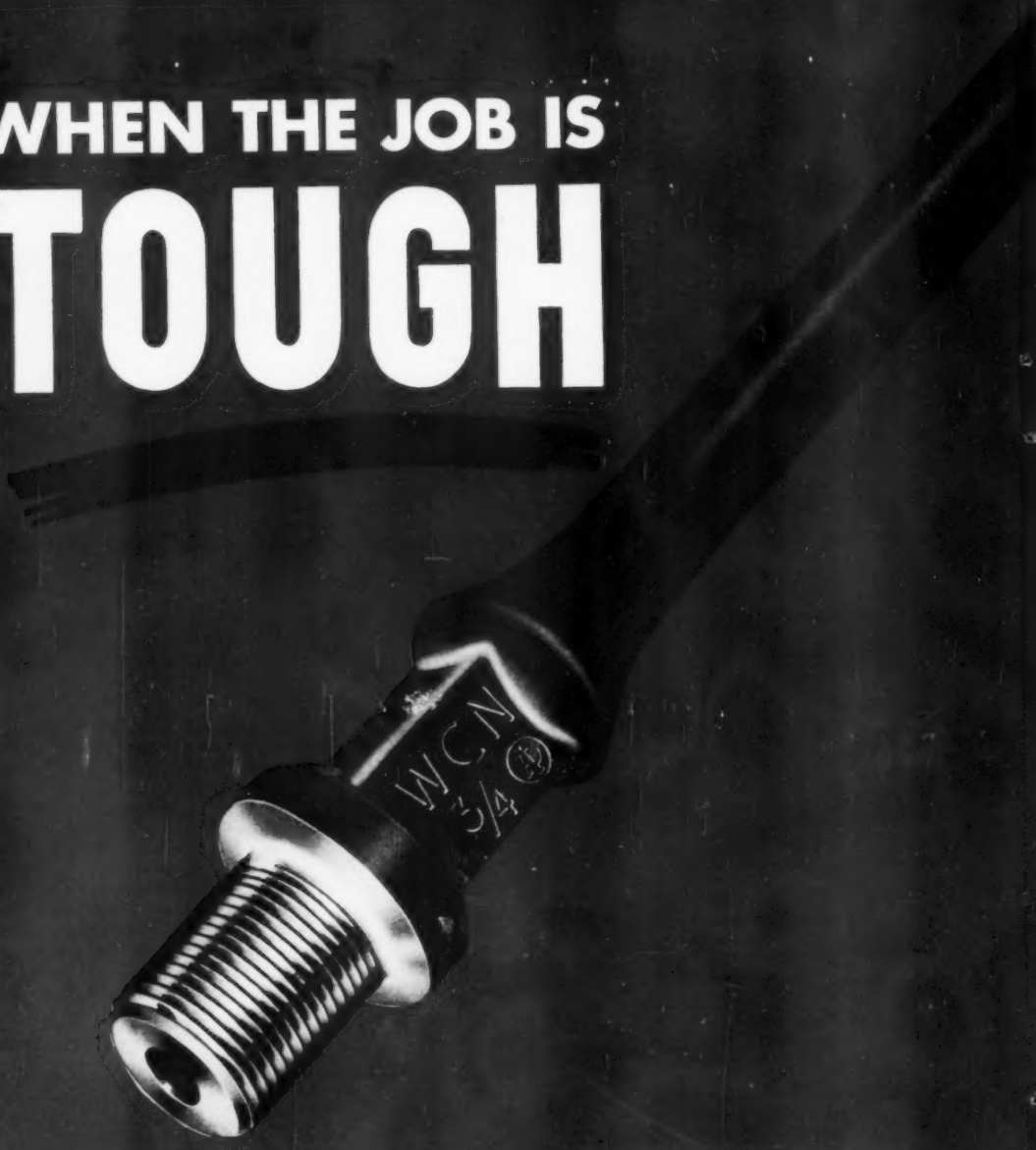
WHEN THE JOB IS
TOUGH



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JOURNALLY Speaking

Not So Mystic

A REGULAR feature of our favorite oil publication is a monthly report on crude production throughout the world, presented the earliest moment it is humanly possible to collect figures from faraway places. For example, this issue carries the details for October.

Now the United States Bureau of Mines has started a similar report. This is O.K. with us. Collection of official statistics is a legitimate function of a government agency. If the bureau had had its report earlier we might never have started ours. But we're going to continue compiling our own report because we are half a year ahead of the bureau.

But we were slightly burned up by the editorial comment in a magazine published in a country which expects its government to do everything. Congratulating the Bureau of Mines on its new service, this writer asserted that never before has there been a reliable, up-to-date picture of world oil production, and added: "True, there are mystic production statistics of surprising up-to-dateness published by certain oil journals, but close inspection over a period soon reveals they are largely 'guestimates,' often put forward with a guise of authoritativeness to which they have no right."

Was he talking about us? Couldn't have been if he really gave our report "close inspection over a period." For instance, last May we reported that world production in March was 9,190,000 bbl. daily. In November the Bureau of Mines came along with its report for March and placed the total figure at 9,206,000 bbl. daily. This is a difference of 16,000 bbl. daily, or 17/100 of 1 per cent. How's that for a "guestimate"? And the bureau admits that its report includes numerous estimates for which information is incomplete or lacking on a current basis.

There is nothing "mystic" about our figures. We get them from reliable sources by a simple, though arduous, job of reporting, only we do it with "surprising up-to-dateness."

But it shouldn't be surprising, if you think about it. If we couldn't operate a lot faster than a government bureau we would not have any excuse to be a weekly. And if we couldn't be sufficiently accurate for all practical purposes we wouldn't have any business publishing statistics. We claim that accuracy to within a fraction of 1 per cent gives us a right to "authoritativeness" which is by no means a "guise."

The point of all this is neither to brag nor to criticize anyone. It's just that it once again demonstrates that private initiative can run rings around any government agency anywhere any time. If you're content to wait 6 months for oil statistics in order to get them under a government label, maybe you'd be content to let the Government run the oil business and wait 6 months—or more—to get oil under a government label.

Classy Classified

OUR classified department got a bit jealous of the new style of layout now being used by the news section, and decided to get a fancy new heading for itself, too, which you can see by turning to the last but not least pages of this issue.

This department now calls itself "Your Market Place for the Oil and Gas Industry," and a perusal of the offerings suggests that the claim is fully justified. During the last couple of weeks, for instance, the classified ads have offered such miscellany as a watch fob, a complete oil refinery, a vacant lot in Edmonton, an airplane (tan, with seat covers), and a used oak bookcase—in addition to the usual bargains in such standard listings as royalties, second-hand pipe of assorted sizes, and odd-lot items of equipment.

If you're worried about completing your last-minute shopping list, any of the above items would be an appropriate gift for wishing some oil man a

Merry Christmas

—Henry D. Ralph

No Other Light-weight Pipe Offers

This **NAYLOR SAFETY** *Feature*

Naylor Pipe alone is built with a lock-seam spiral extending the full length of the pipe. This creates a structure that is pipe before it is welded, whereas other light-weight pipe depends on the weld to hold the pipe together. In Naylor, the lock-seam carries the load. The weld acts merely as a seal.

The resulting Naylor structure provides a continuous expansion joint that absorbs shock loads and vibration, and cushions expansion and contraction under varying changes of pressure, temperature and ground stress. This extra safety factor is provided only in Naylor Pipe—just one of the reasons why Naylor is a stand-by in oil field service.

Sizes from 4" to 30" in diameter; thicknesses from 14 to 8 gauge; all types of fittings, connections and fabrications. Write for Catalog No. 44.

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Exclusive distributors in
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Big oil man operating in proven field
From the Dallas Morning News.

Growing Reserves

"When definite plans for the pipe line from Edmonton to the lake head were formulated last spring, Alberta reserves were estimated at 1 billion barrels—an amount sufficient to supply the line at its initial rate of operation for about 25 years. Since that time other discoveries have been made and by the spring of 1951—when the line is in operation—reserves will probably have increased to 2 billion barrels. . . .

"Canada is witnessing only the beginning of a new era in oil development and in the transportation problems which accompany it. Other pipe lines will probably have to be built to provide markets for the ever-increasing flow of Alberta's wells."

Dr. C. B. Hopkins, vice president, Imperial Oil, Ltd., addressing Empire Club, Toronto.

Shared Knowledge

"The benefits of petroleum research are not confined by international boundaries or by the keen competition for which the industry is noted. There is a tradition of sharing, on a reasonable royalty basis, the results of scientific effort as soon as improvements in design have been made or new processes have been discovered and proved practical. Invariably the discovering company has made them generally available to others in the industry at once. For instance, the phenol method of removing elements that tend to form sludge in lubricating oils was discovered by Imperial

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IN TULSA

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WING THEIR WAY

TO ALL THE FOLKS
AT YOUR HOUSE

FOR A HAPPY HOLIDAY

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C-O-TWO manufactures and install. fire protection systems for one, two, twenty-four, sixty or any number of enclosed or semi-enclosed spaces. Let an expert C-O-TWO Fire Protection Engineer help you plan modern, dependable, fully approved fire protection for your property now, before fire strikes. Remember . . . tomorrow may be too late. Write us today for complete information.

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at Sarnia. Today it is employed in the refining of nearly half of the lube oils produced anywhere in the world. Similarly, other important processes developed at Sarnia, such as the ketone solvent method of removing waxes from lubricating oils or the suspensoid process of catalytic cracking, are generally available to the industry under licensing arrangements.

"This attitude is one of the reasons for the rapid progress which has been made in proving new products, in improving existing ones, and in reducing costs so that petroleum products may be available to the many instead of the privilege of a few."

Imperial Oil Review, Imperial Oil, Ltd.

Gas-Industry Gains

"By all standards, the gas industry stands at an all-time high in its service to the nation. The gas-utility industry serves approximately 23,000,000 customers, with an additional 5,000,000 customers getting the benefits of the gas flame from our ally, the liquefied petroleum gas industry. This represents an increase of more than 1,000,000 utility gas customers since this time last year and places approximately 100,000,000 Americans within the reach of modern gas service. Today, natural gas alone supplies nearly 15 per cent of all the energy in the country."

Financial Bulletin, American Gas Association.

Oil Abroad

"The outflow of petroleum capital was relatively large and accounted for about three-quarters of the direct-investment outflow, excluding reinvested earnings, during 1946-48 and almost one-half the total increase in the value of direct investments. At the beginning of this period about 18 per cent of total direct investment capital was in that industry; by 1948 the proportion had increased to 26 per cent. About half of such outlays were made in Latin America, and a large portion of the balance was expended in the Middle East."

Survey of Current Business, U. S. Department of Commerce.

Social Engineers

"The present may well be called the age of anxiety. The buoyant optimism of the nineteenth century, lifted to the heights by the promise of science triumphant, hand in hand with political democracy, has collapsed before our eyes. . . . In the social sphere we face the rise and spread of an amoral communism which denies the dignity and integrity of man. . . . In both science and philosophy the meaning of the uncertainty principle makes us doubt that knowledge can be expanded

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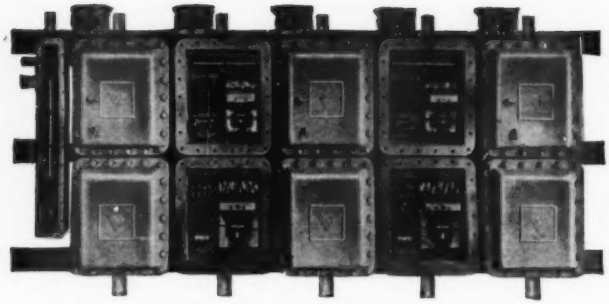

EXPLOSION PROOF CONTROL PANEL FOR FIVE GROUPS OF ELECTRICAL STRIP HEATERS INSTALLED ON ETHYLENE GAS PIPE LINES & DRUMS. THE PANEL MADE UP OF FIVE SECTIONS & EACH SECTION CONTROLS SEPARATELY ONE GROUP OF HEATERS. A MOTOR OPERATED SEQUENCE SWITCH & TEMPERATURE INSTRUMENTS (NOT SHOWN) OPERATES THE VARIOUS CONTACTORS & RELAYS SO THAT THE HEATERS ARE CONNECTED IN PARALLEL OR IN SERIES DEPENDING ON THE TEMPERATURE REQUIREMENTS.

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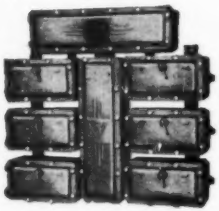

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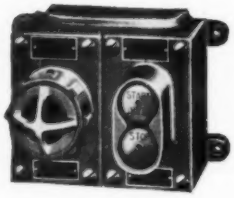

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without limit. In both science and sociology, we are acutely aware of the second law of thermodynamics, which clearly implies that the universe is running down. In technology we foresee the exhaustion of our low entropy reserves of fuels, metals, and fertilizers. In political economy we ride a ground swell of programs and policies which can only lead to the dissipation of our capital, to the eating of our seed corn before it can be planted. In every area of mind and matter we see entropy rising at an appalling rate.

"In the domestic economy we face a series of conflicting aims. How can we broaden the distribution of wealth without destroying the incentive for production? How can we raise wages without increasing prices? How can we increase our security without losing our freedom? . . . Everywhere we are confronted with problems that are mutually inconsistent, and it is evident that they can be resolved only by finding a working compromise.

"This is indeed a dismal outlook—for anyone who is not an engineer. . . . We defined engineering as the finding of a working compromise among requirements that are mutually inconsistent. This definition seems to be equally valid as a definition of statesmanship. If we foster the use of the engineering method in the analysis and discussion of social problems, each in his own community and in his own way, we can all be statesmen in a world that is crying out for statesmanship."

Dr. Mott Souders, Shell Development Co., upon receiving professional progress award of Celanese Corp. of America, Pittsburgh.

Contradiction

"Walter J. Levy, New York consultant, speaking in Washington last week, is reported by the press to have said that the "newcomers" in the Middle East will find it very difficult to market any production they find. Lacking refineries and Asiatic marketing arrangements, and further handicapped by the higher royalty rates they have had to agree to pay, the future as seen by Mr. Levy is not rosy. Outlet for the production of several companies who have obtained concessions in the past year or so would probably have to be sought in the United States, Mr. Levy said. He spoke at the School for Advanced International Studies, sometimes referred to by the irreverent at 'Aramco U.'

"The reading of his remarks brings a recollection of the State Department's attitude of scarcely 2 years ago. It was then evangelical on the subject of independent participation in the Middle East oil. Just one of life's contradictions, perhaps."

Russell B. Brown, general counsel, report to I.P.A.A. President Ed Warren.

to the Oil and Gas Industries

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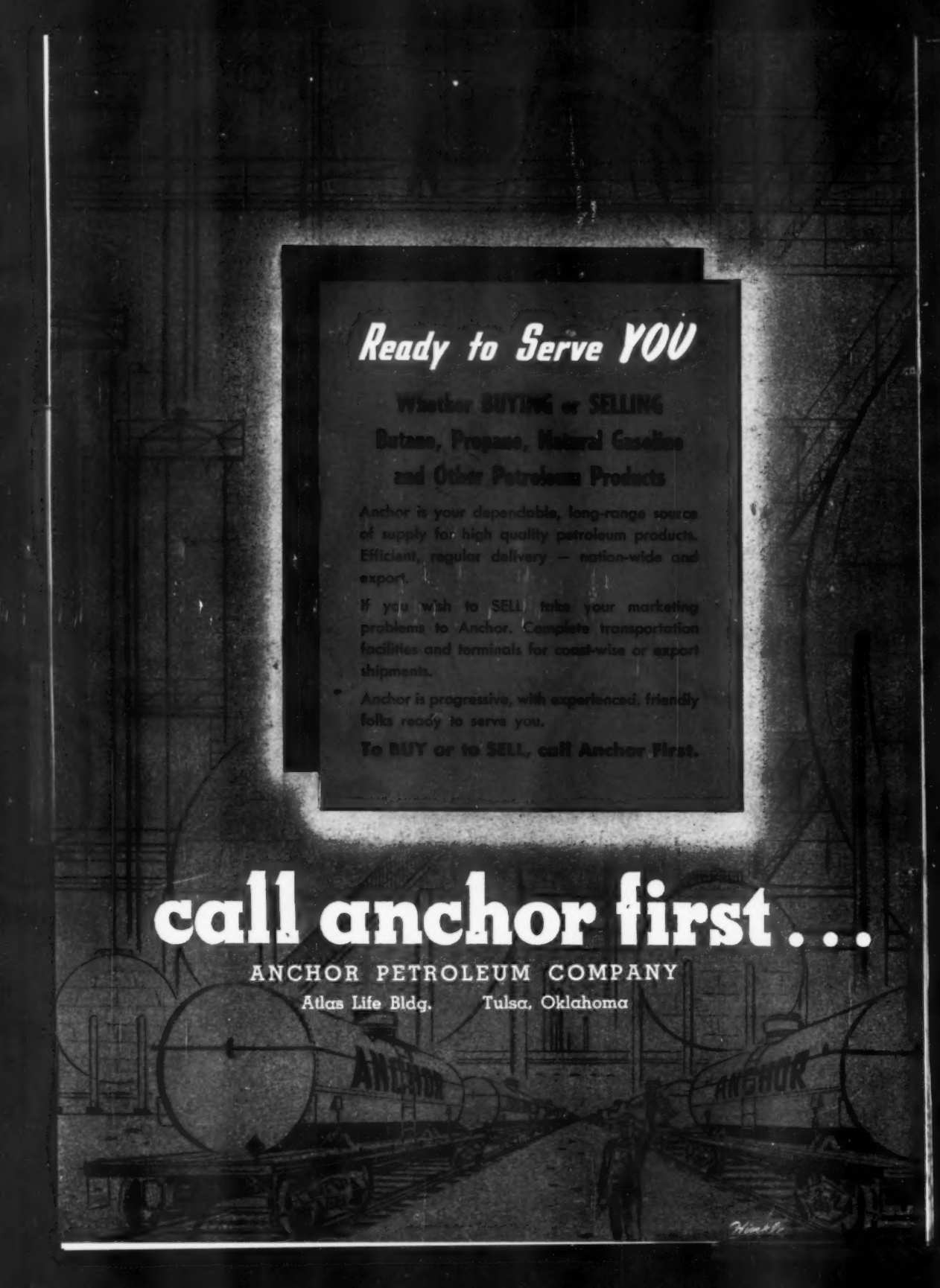
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Peace On Earth

THIS international issue featuring developments in petroleum outside the United States is published in the week which includes the natal day of the Christian world.

It so happens that the world's petroleum operations up to now are almost exclusively controlled by people of the Christian faiths who collectively account for only about 25 per cent of the world's population. This same quarter fraction, centering in the English-speaking countries, consumes all but 15 to 20 per cent of current petroleum supplies.

Therein lies a many-headed responsibility. There is the duty to the 75 per cent whose small consumption of oil is reflected in their standard of living and in their position in world affairs. Petroleum, the commodity needed to bring economic advancement to these peoples, is now at hand. Non-Christian countries have about half the proven reserves.

To these peoples oil is now supplying funds for impoverished governments to carry on many needed programs for their peoples. The operating companies are training nationals in the know-how of operation and improving living standards in many ways.

Away from these vast marginal areas accounting for more than half of the world's population, there are the peoples—mostly Christian—whose position in many of the arts and sciences is comparable to our own but where general economic progress has been held back because of the lack of services which oil affords.

A start has been made. There is recovery from the war's devastation in Western Europe and elsewhere, largely because it has been possible greatly to expand petroleum consumption.

There are many confusing problems yet to solve. That should not becloud the fact that the primary objective of all that has been accomplished by operators and their governments in the maintenance and spread of Christian principles to the end that those things which make for permanent peace may spread to include the entire world.

THIS WEEK

INTERNATIONAL—Foreign crude production hit a new high for the year in October, continuing a 4-month trend. . . . Slight increases in Venezuela and a big gain in the Middle East brought output to 3,643,600 bbl. daily. . . . ¶British move to curtail imports of dollar oil. . . . Action puts squeeze on American companies. . . . ¶Annual roundup of international operations appears in this issue.

TECHNOLOGY—Supersonic vibrations offered to industry through development of war-discovered apparatus. . . . Said to have many oil applications. . . . ¶Atomic Energy Commission reports successful use of radio-isotopes in pipe lining. . . .

INDUSTRY AFFAIRS—Texas allowables cut another 83,373 bbl. per day for January. . . . State's share of U. S. production now only 40 per cent, compared with 44.5 per cent year ago. . . . Other major producing states join downward trend. . . . ¶A.P.I. year-end estimates reveal U. S. domestic consumption hit new high in 1949. . . . But declining exports and slow fuel-oil sales kept total activity below 1948. . . .

TRENDS—Stocks of crude and four major products dropped 8,235,000 bbl. for week ended December 10, a new postwar record for stock withdrawals in a week. . . . Major product stocks decreased 6,291,000 bbl., or 899,000 bbl. daily. . . . ¶Crude stocks dropped 1,944,000 bbl., or 277,000 bbl. daily. . . . Previous record was set during a period of cold weather in December 1947. . . .

BOOM AREAS—Spectacular Scurry County reef production may be extended north and south into adjacent West Texas counties. . . . Discovery wells at both ends of play excite interest. . . . Plans for gasoline plants and more pipe lines are in progress. . . . ¶Oklahoma's Ringwood field is most active area in Mid-Continent. . . .

REFINING—New national trade association formed. . . . Independent Refiners Association of America plans aggressive action to defend position of members. . . . ¶Sinclair Refining Co. makes 309-hour turnaround after 608-day run at its East Chicago plant. . . . ¶Construction under way to modernize California Refining Co.'s plant at Barber, N. J. . . . New facilities will include a crude unit, catalytic cracking unit, and reformer. . . . ¶C. F. Braun & Co. awarded contract for modified Thermofor catalytic cracking unit at Socony-Vacuum Oil Co., Inc.'s Trenton, Mich., refinery. . . .

FIGURES—Rotary rigs operating in United States and Canada set a record for the year at 2,284 on December 12, up 31 from the previous week. . . . ¶Total well completions for the week ended December 17 amounted to 871, another weekly record. . . . ¶Crude production for week ended December 17 averaged 4,951,750 bbl. daily, about 680,000 bbl. daily less than the same week last year. . . .

PIPE LINES—Pipe lining history made by Mid-Valley crossing of Mississippi River. . . . First major crossing to use concrete casing instead of river weights. . . . ¶El Paso Natural Gas Co. seeking FPC authority to make changes in previously authorized facilities on its natural-gas system. . . . ¶Mid-Continent Pipe Line Co. expands its system with property transactions and construction. . . . ¶Piedmont Natural Gas Corp. outlines plans to FPC for construction of pipe-line system to serve Virginia and the Carolinas with natural gas. . . .

NATURAL GAS—Michigan-Wisconsin Gas Co. and Michigan Consolidated Gas Co. seeking FPC permission to construct facilities which would nearly double present annual sales capacity of the former firm's system. . . . ¶Hearing held by FPC on Panhandle Eastern Pipe Line Co.'s proposed natural-gas tariff. . . .

SAND AND STEEL.—Typical of some of the oil operations abroad, described in this special International Number, is Ras el Misha'ab on the Persian Gulf in northern Saudi Arabia. It is the receiving port and headquarters of the eastern division of Trans-Arabian Pipeline Co. In the right foreground is the pipe plant and stock pile. Two years ago there was nothing here but the sand and the gulf which stretch in the background as far as the aerial camera could record

Unusual River Crossing

Mid-Valley uses concrete coat instead of river clamps to cross Mississippi; trench made for two 20-in. lines

Paul Reed

ROLLING FORK, Miss. — A new method of laying a pipe line across the bed of a big river brought dozens of pipe-line engineers and executives here to watch the operation.

It was the successful crossing of the Mississippi River near here by twin 20-in. crude-oil lines of Mid-Valley Pipe Line Co. (Sun and Sohio).

Nicknamed by the industry "the million-dollar crossing," the project is notable for being:

1. The first long river crossing in the United States in which the pipe was encased in concrete instead of being held down by conventional river clamps or by weight of thick pipe walls.

2. The first to trench entirely across this part of the Mississippi River. Furthermore, deep trenching—10 ft. below the lowest point of the river bed—was done to safeguard against flood damage.

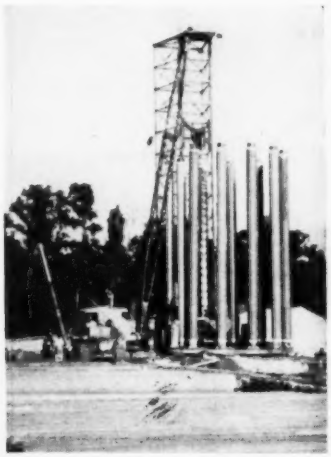
The continuous concrete coating, $1\frac{1}{2}$ to $1\frac{3}{4}$ in. thick, distributes weight more evenly than river clamps. It also provides additional stiffness to the pipe itself. These factors are expected to minimize the danger of breaking from vibration should "bridging" occur because of scouring of the river bed during floods.

The concrete protects the underlying Somastic coating on the pipe from injury both from handling operations during construction and by abrasion while in service on the river bottom.

J. B. Turner, supervisor of western section of Mid-Valley's 1,000-mile pipe line

How it was done.—The concrete encasement was applied to the pipe by novel equipment developed by H. C. Price Co. and just put into operation at its plant at Harvey, La., near New Orleans.

First a $\frac{5}{8}$-in. Somastic coating was put on the 20-in. pipe in the usual way. Then the 40-ft. joints were wrapped with prebent, 2-in. by 2-in. wire mesh, held away from the coating by "chairs." The mesh served principally to prevent any large pieces of the encasement from spalling away from the Somastic in case of undue stress either from extraordinary deflection of the line after installation or from some mishap during construction.

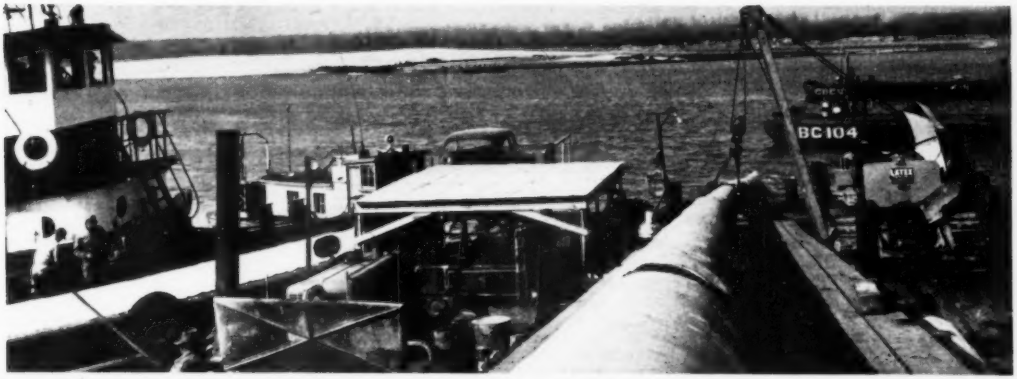


View of coating plant. Concrete is applied over Somastic coating

The joints then were stood on end on a "merry-go-round" which turned them past a tower for the cementing process. A round hopper was drawn up each joint in 4 minutes, extruding cement firmly through and over the mesh.

The turntable holds 12 joints, and by the time a joint had made the circuit the cement was hard enough for the pipe to be lifted off by a crane and racked for air curing. It then could be handled by wire line without slings, as there was no danger of damaging the Somastic coating.

The encasement was composed of a rich, "dry," grout-mix concrete, using high-early-strength cement. The pipe with coating and concrete weighed



Concrete encased pipe on Latex Construction Co. ramp barge where 120-ft. sections were added. Line is supported in the distance by two lowering-in barges

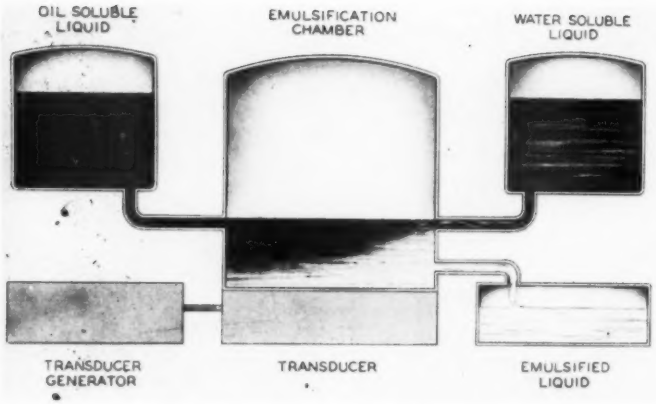


Diagram showing how an "ultrasonic transducer" can be used to form an emulsion of oil and water by shaking up the molecules with sound waves of extremely high frequency

275 lb. per lineal foot in the air. Negative buoyancy was estimated to be about 50-60 per cent.

Laying the pipe.—The encased pipe was "triple jointed" at the Harvey plant to form 120-ft. sections, and the 19,200 ft. of encased pipe was barged the 200 miles upstream to the crossing site.

In making the crossing, the 120-ft. sections were welded to the line on a ramp barge. All welds were X-rayed. The bare space at the weld was covered with Somastic but not with concrete. A floating crane was used to lift the pipe.

From levee to levee, the distance across the river is 3,500 ft., and the actual water crossing at mean low water is 2,900 ft. In constructing the crossing, the contractor, Latex Construction Co., used one of the largest dredges available for digging the two trenches, which were approximately 150 ft. wide at the bottom.

The camber of one line is upstream and the camber of the other is downstream, thus giving ample working space between them for anchoring construction barges. Trench excavation and laying of the pipe was accurately checked by supersonic sounding equipment.

Significance.—While this river crossing is reported to cost four to five times as much as a usual Mississippi River crossing, the additional investment gives assurance of continuity of safe service.

The new procedure promises to influence practices in 1950, when more pipe lines will be laid across the Mississippi than in any previous year.

The largest potential market for concrete-encased pipe is regarded as existing in the 75-mile swamp-land belt extending 400 miles from New Orleans to Houston, where a large amount of pipe lining is being done to serve oil and gas operations.

Harnessed Sound

Supersonic waves may have uses in petroleum industry

CLEVELAND.—Supersonic "sound" waves, inaudible to the human ear, can now be harnessed for industrial uses and may find applications in various petroleum operations.

This is the belief of Brush Development Co. of Cleveland, which announces that it is now prepared to supply equipment to use ultrasonic force in pilot-plant experiments and even for full-scale, custom-built production units, as well as for laboratory studies.

(An experimental "sonic pump" which uses ultrasonic vibrations to force liquids up an oil well, now being tested in California, was described in The Oil and Gas Journal, October 20, 1949, page 125.)

The phenomenon of ultrasonic force was discovered by Jacques and Pierre Curie in 1880 but its application has been confined to a few uses because of the limited supply of quartz crystals which until recently have been the only device with piezoelectric (literally "squeeze electric") properties.

Research in World War II showed that certain ceramics containing titanium exhibited dielectric capacitance in excess of previously known materials.

Building on this, the Brush company is now producing ceramic "transducers" in many shapes and sizes, tailored to generate ultrasonic vibrations suitable for many industrial uses. The manufacturer claims that the new elements are superior to quartz crystals not only because of their larger size and lower cost but also because they develop high power without high voltage and the ultrasonic force may be directed and focused as desired.

Possible uses.—Industrial applications of ultrasonics suggested by Brush include:

1. Emulsification of nonmiscible liquids, such as oil and water.

2. Suspension in a liquid of powdered material of different basic characteristics.

3. Rearrangement of molecular structure within a great variety of substances.

4. Acceleration of bacterial growth, or destroying bacteria.

5. Acceleration of electrolytic agents, as in plating operations.

How it works.—Ultrasonic energy is a newcomer as an industrial force, and its applicable actions, effects, and benefits may be realized from study of the force itself.

As compared to gravity, which produces an increase in velocity of 32 ft. per second each second in a falling body, or with the acceleration of a bullet fired from a rifle, the acceleration in a high-intensity ultrasonic wave in a liquid is extraordinary.

The acceleration rate may be as high as 12,500 miles per second each second. In application, this action is repeated first in one direction and then in the opposite direction as much as 1,000,000 times per second. When directed into the molecules of a substance under treatment, this force can cause changes in molecular structure and other properties of the material.

Isotopes for Pipe Lining

New uses for radioactive isotopes in the petroleum industry are being reported with increasing frequency.

The latest report concerns two applications to pipe lining, described to the Pittsburgh meeting of the American Institute of Chemical Engineers by Logan B. Emlet, director of the operations division of the Oak Ridge National Laboratory.

A small piece of radioactive cobalt, fitted to a pipe-line scraper makes it easily located with a radiation detector (geiger counter) should the scraper become stuck in a buried line.

Radioactive barium is used in marking the interface between two different streams in products pipe lines. Soluble in the oil products, it travels long distances without appreciable diffusion and provides a signal on approaching a terminus or switching point, thus allowing sharper separation of products at the receiving point. Automatic switching is a possibility, with the radiation detector actuating motor-operated valves through electronic controls.

Emlet reported that shipments of radioisotopes from the Atomic Energy Commission increased by about 150 per cent during the past year. The average selling prices have been reduced about 200 per cent in the past 3½ years, and further reduc-

tions can be expected through improved processing methods.

A number of other oil-industry applications of radioisotopes were described in The Oil and Gas Journal of December 1, page 42.

Study in Fuels, Engines

NEW YORK.—How to drive an automobile 150 miles on a gallon of gasoline will be explained to the annual meeting of the Society of Automotive Engineers in Detroit January 9-13, according to an advance announcement of the program.

Billed for a paper on this subject is R. J. Greenshields, director of research for Shell Oil Co., Wood River, Ill.

General theme of the meeting is pathfinding in fuels and engines, and this is also the title of an address to be given by T. A. Boyd, consulting engineer of Research Laboratories Division, General Motors Corp., Detroit, upon receiving the S.A.E. Horning memorial medal for research in the mutual adaptation of fuels and engines.

Petroleum interest in the meeting centers in the sessions of fuels and lubricants section, which will include a discussion on the performance of high-viscosity-index motor oils by a group from Standard Oil Development Co., and a symposium on combustion of fuels participated in by 10 oil-company and university research men.

Gas-Turbine Locomotives

WASHINGTON.—Gas-turbine locomotives of large capacity may soon make some types of diesel engines as obsolete as the diesel now is making the steam engine, and open up new markets for low-grade oils.

The new engines have been in course of development for more than a year, and test units are now being built in at least two plants. Designed to burn low-cost fuel—eventually either coal or oil—their big advantage will be a marked reduction in maintenance expense as compared with the diesel.

Over the period of a year, the percentage of freight train gross ton-miles handled by diesel locomotives increased from 19.49 to 31.9, while that handled by coal-burning steam engines dropped from 60.65 to 51.74 and by oil-burning steam engines from 17.84 to 14.25, according to Interstate Commerce Commission figures.

The ICC called attention to the fact that the cost of fuel oil decreased 19.6 per cent and diesel fuel 5.5 per cent in the first 7 months of 1949 as compared with the same period last year, while the unit costs of coal and electric current increased 3.4 and 5 per cent, respectively.

WATCHING WASHINGTON

Bertram F. Linz

British Stall

The Anglo-American oil talks appear to have been transferred to London where, it is reported, British oil officials are conferring with representatives of the American oil companies.

The Washington talks, suspended some weeks ago, are scheduled to be resumed in the near future, probably after the turn of the year, and it is possible that the meetings in London are intended to give the British delegation information on which they can later discuss a paper submitted some time ago by the American group, outlining Washington's views on what can be done to ease Britain's dollar drain.

That paper reportedly laid down the principles for a basis on which the individual companies would be able to negotiate on convertibility in their individual markets and work out market agreements with the British in each area.

Meanwhile, there is no indication that England is preparing to modify its plan for expanding its oil industry with a view to trying for a larger share of the dollar oil market. Refinery construction is going ahead as originally scheduled, despite arguments of the Economic Cooperation Administration that the expansion program should be held within the bounds of a foreseeable market in which the interests of the United States companies will be protected.

Antitrust Joker

A couple of cabinet officers apparently got their wires mixed recently and when they were untangled what looked at first to be a governmental helping hand to industry turned out, as usual, to be another eight-ball.

It all started when Commerce Secretary Charles Sawyer announced that, under instructions from the President, he was setting up an interagency group to take a "new look" at the antitrust laws and develop a "positive" approach to them through an educational campaign to encourage business voluntarily to abandon undesirable practices.

Department of Justice officials promptly vetoed any plans to set up a clearing house to warn businessmen when they might be violating the laws, said there would be no change in present enforcement policies and added, in proof, that three more antitrust cases would be filed before the end of the year.

Thereupon, Sawyer issued a clarification of his original announcement, explaining that his group, to be known as the "President's Committee on Business and Government Relations," would have the job of presenting to the President a program of action in the field of monopoly, competition, and restraint of trade "designed as a supplement to, and in no way a substitute for, vigorous enforcement of the antitrust laws."

The basic objectives of the committee will differ in no way from those which have been proffered in congressional and governmental circles in the past—to stimulate competition, strengthen and broaden government efforts for the prevention of monopoly and restraint of trade, and build a sound basis of mutual understanding between business and the Government.

In short, enforcement of the antitrust statutes will continue to rest in the Department of Justice, and since Atty. Gen. J. Howard McGrath is vice chairman of Sawyer's committee there is little likelihood that any other agency will be able to grab any of that authority.

Construction Declining

Industry is fast catching up with facility needs which developed during the war years and the subsequent business boom, and expenditures for new plant and equipment are tapering off.

Government estimates place the expenditures on new plant and equipment this year at slightly less than 18 billion dollars, some 1.3 billion under the 1948 peak of 19.23 billion, and indications are the 1950 expenditures may not touch 16 billion.

In the past 4 years, industry, transportation, utilities, and commerce have spent approximately 65 billion on new plant and equipment. The annual average was double the immediate prewar rate of 8 billion in 1941.

While the lower 1949 volume of expenditure reflects the decline in costs during the year, this covers only part of the drop and does not enter into the estimate that expenditures for new plant and equipment in the first quarter of 1950 will approximate 3.82 billion as compared with 4.43 billion for the quarter now ending.

Lower January Output

Producing days again down to year's low; only Illinois, Louisiana end year with higher output than at beginning

Leigh S. McCaslin, Jr.

AUSTIN.—Texas will enter the new year with a daily crude production of some 500,000 bbl. less than on January 1, 1949. In addition, the state will be producing only 40 per cent of the nation's crude supply as against 44.5 per cent a year ago.

Texas is not alone. A comparison of latest available production figures with those of last January shows that production has declined in six of the eight major oil states. Only Louisiana and Illinois have shown increases. Illinois has gained only a comparatively small amount, but Louisiana is up 40,000 bbl. daily, or 8 per cent of its January 1 production.

Downward trend.—Texas production started downward last December when the Railroad Commission ordered a 4-day shutdown for most of the state's fields. This marked the first time since September 1947 that the state as a whole had produced below legal maximum rates. Following the January cutback, the commission reduced the state's output for eight consecutive months. Then, production started slowly back up and was increased for September, October, and November. This month the trend started back down when the commission slashed 2 days off the December producing schedule thus reducing output 218,000 bbl. daily.

AUSTIN. — Applause greeted the appearance of William J. Murray, Jr., chairman of the Texas Railroad Commission, at the monthly proration hearing in Austin last week. Murray was seriously injured in an automobile accident last September and was attending his first hearing since that time.

The downward trend was continued last week when the commission issued an allowable order for January calling for 17 producing days in most of the state's fields and 15 for East Texas field. Effect of the order was to reduce the average daily allowable by 83,373 bbl. to 2,050,948 bbl. The number of producing days equals the low for the year which was reached during July and August. However, new wells brought in since summer will keep the state's output higher than the July-August low.

Testimony.—Imports and taxes highlighted the discussion and testimony offered during the hearing. Commissioner Ernest O. Thompson read into the record a forecast that imported oil will average 845,000 bbl. daily during the next 3 months, compared with 678,000 bbl. this year and 513,000 bbl. in 1948. Chairman William J. Murray, Jr., expressed regret that imported oil is hurting the market for new production developed by United States operators since World War II. He added that the nation needs continued exploration for security purposes.

H. P. Nichols, executive vice president of the East Texas Oil Association, brought up the tax question with a remark that "The state seems destined to go into a sales tax." The Texas legislature meets in January to consider increased taxes. Each decrease in the state's crude allowable makes the problem more serious. After the hearing, Gov. Allan Shivers told newsmen that he is against the sales-tax proposal.

Commissioner Olin Culberson brought up one of his favorite subjects at the hearing—the export of Texas natural gas. "Natural gas will displace any fuel in its price range," Culberson said. "Exported Texas gas is affecting the market for Texas oil, and we'd better get concerned about it."

The next statewide proration hearing will be held at the Rice Hotel, Houston, on January 17 at 10 a.m.

Time Saver

Hallowe'en had nothing to do with the location of this revolving crane atop the filter house in the Baytown, Tex., refinery of Humble Oil & Refining Co.

It's there because the company found that it could save 24 man hours on every car of sand unloaded for sandblasting operations.

Formerly sand was shoveled by hand into conveyors which carried it up to a drier inside the building. Five men worked 8 hours to unload a car. Now the crane picks up a quarter of a yard of sand at a trip, lifts it to the roof, and drops it through a hopper and chute into the drier. Two men now unload a car of sand in 8 hours.

Aminco Stock Deal

Deep Rock Oil Corp. has arranged to sell one-half of its interest in American Independent Oil Co. to a group of Chicago investors not heretofore active in the oil business.

Deep Rock was one of the original partners in Aminco, taking approximately 6¼ per cent of the stock. It is understood that Deep Rock paid about $1,000,000 for this stock and will now receive $1,100,000 for the half it is selling.

Aminco was organized in 1947 and has since acquired concessions in the Kuwait-Saudi Arabia neutral zone in the Middle East and a de-

velopment contract in Mexico. Other partners are J. S. Abercrombie Co., Ashland Oil & Refining Co., Globe Oil & Refining Co., Lario Oil & Gas Co., Hancock Oil Co., Phillips Petroleum Co., Signal Oil & Gas Co., Sunray Oil Co., and Ralph K. Davies, president of Aminco.

Refiners Organize

I.R.R.A. to serve as voice for nation's independents

HOUSTON.—Formation of a national organization of refiners, to be known as the Independent Refiners Association of America, was announced here December 17 by Harry Leyendecker, vice president of Eastern States Petroleum Co. and temporary chairman of the association's executive committee.

Initial plans for the organization were laid in Chicago November 7 when approximately 70 representatives of independent refiners attending the American Petroleum Institute convention held an informal meeting. Initiative came from the recently reactivated Gulf Coast Refiners' Association.

The new group claims membership in 25 states. It will maintain headquarters in Houston and plans state and regional offices to deal with local matters.

"The association will act as spokesman for the independent refiner in much the same manner that other strong associations today represent and act for other segments of the oil industry," Leyendecker said. "Expansion of the Gulf Coast Refiners' Association, with its necessarily limited membership was a result of strong demand from independent refiners all over the country.

"Conditions in the industry which have led in recent months to closing of a number of independent refineries has created an emergency. The association will work by all lawful and legitimate means to prevent additional closings and, in cooperation with other units of the oil industry and with the understanding and help of the general public, to bring about conditions which will enable the independent refiners to survive.

"The I.R.A.A. will carry on an educational program within the oil industry and work with members of Congress and congressional committees to present independent refiners' viewpoint on legislation affecting the industry. It will also act as spokesman for independent refiners on local, state, and regional levels. Every other oil industry group, from producer and royalty owner to the large integrated companies, has an authoritative spokesman."

Other members of the executive committee are: M. H. Robineau, president of Frontier Refining Co., Denver; Fred C. Koch, president of Wood River Oil & Refining Co., Wichita, Kans.; D. E. Foster, president of Wisconsin Oil Refining Co., Sheboygan, Wis.; James P. Dunnigan, president of Producers Refining, Inc., West Branch, Mich.; Robert O. Anderson, president of Malco Refineries, Inc., Roswell, N. M.; M. L. Freese, vice president of Bell Oil & Gas Co., Tulsa; and D. W. Hovey, president of Danaho Refining Co., Houston.

Building Fund

SNYDER, Tex.—The Scurry County boom brings a reminder of an old familiar story in the oil business. The little, white frame church in the country gets an unexpected financial windfall.

The Union Baptist Church, 5 miles west of Snyder, in Scurry County, received $1,000 as lease bonus for its 2 acres, from Stuart Hunt and Sherman Hunt, Jr. This picture shows Theck & Cross Drilling Co., of Dallas, rigging up No. 1 Union Baptist Church. The pastor, Rev. Jack O'Neal, said the money would be applied to the building fund.

Many oil men, including of course the Hunts, are hoping that history will repeat itself so that the royalty income to the church will eventually be sufficiently large to permit replacement of the small frame building by a handsome brick structure, as has happened in many other oil fields.

Great Lakes Tankers

Two new tankers, each capable of carrying 5,000,000 bbl. of crude oil in a season, have been designed for use in the Great Lakes. Construction will begin immediately and will be completed in 1951.

These tankers will carry Alberta crude from the eastern terminus of the interprovincial pipe line at Superior, Wis., to Sarnia, Ont., Canada. Each will have a capacity of about 115,000 bbl. of oil, and will be able to make the round trip between Superior and Sarnia in 5 days. They will be roughly twice as large as any now operating in the Great Lakes.

Pumps on the ships will give them a discharge capacity of 15,000 bbl. per hour, and pumps at Superior will load them at a rate of 20,000 bbl. per hour. Length of the new tankers will be 620 ft.; beam, 68 ft.; and depth, 35 ft. They will be powered by 4,500-hp. geared turbines.

The ships will be built for Pipe Line Tankers, Ltd., a newly organized company, by Port Arthur Shipbuilding Co., Ltd., and Collingwood Shipyards, Ltd., at a total cost of $7,800,000. They will be chartered to Imperial Oil, Ltd., for 15 years.

Domestic Record

Demand at new peak, but exports continue to decline

NEW YORK.—Domestic consumption of petroleum products reached a new high during 1949, topping the 1948 record, but when exports are considered the total demand dropped below the all-time peak of last year, according to preliminary estimates of the American Petroleum Institute.

In a year-end review, the Institute said that the oil-industry's activity boomed along at near-record levels but for the first time since 1942 the annual statistics fail to show increases over the preceding year. It attributed this largely to declining exports and unseasonably warm weather.

Highlights of the review include:

Domestic demand in 1949: estimated at 2,110,302,000 bbl., an increase of 1,930,000 over 1948.

Total consumption, including exports: 6,105,000 bbl. per day (average), compared with the all-time 1948 high of 6,129,000.

Exports: off 40,000 bbl. per day, continuing a 5-year decline.

Production of motor fuel: a new high of 960,000,000 bbl., an increase of 38,000,000 over last year.

Domestic crude-oil production: 1.8 billion barrels, down 176 million from last year. Production of natural-gas liquids: 153,000,000 bbl., up 7,500,000 bbl. Total of both: 1.9 billion barrels, a decline of 188 million.

Refining capacity: increased 73,000 bbl. per day to all-time high of 6,550,000 bbl., including plants operating, shut down, and under construction.

Investment of capital in the oil industry: over 2 billion dollars for the third straight year.

Gas, Fuel-Oil Study Asked

WASHINGTON.—A factual study of the natural gas-fuel oil situation was asked of the National Petroleum Council this week by the Interior Department.

The study, which will be passed upon by the council at its first 1950 meeting next month, would tie in with a survey of the liquefied petroleum gas situation now under way and a proposed inquiry into the coal situation which the National Security Resources Board would like to have made.

The NSRB is concerned over the future of the coal industry and the danger to national security in an economy so tightly geared to oil and gas as to put a possible limit on the fuel available for military operations in the event of war. Interior is concerned over the effect on the oil industry of continued expansion of natural gas use, particularly the impact on fuel oil.

The council investigation would go into the question of gas reserves and their adequacy for future expansions of distribution that may be anticipated; the effect of gas competition upon fuel-oil production and the trend of future demand; and in all probability will require consideration of imports.

Superior Reorganizing

LOS ANGELES.—Superior Oil Co. has begun legal steps to dissolve and convey its assets to two new corporations, Superior Oil Co. and Superior Gas Co., both Delaware corporations.

Superior Gas Co. will take over all the gas business of the present company. It will maintain headquarters in Houston, with Howard B. Keck as president.

Superior Oil Co. will assume the oil business of the present company. William M. Keck, Jr., will be president, and offices will remain at the present location in Los Angeles.

Stockholders will vote on the plan December 29. William M. Keck, Sr., and children own 52.75 per cent of the common stock.

No Infringement

BALTIMORE. — Esso Standard Oil Co. does not infringe upon patent rights to a sulfuric acid alkylation process held by Phillips Petroleum Co., a federal court here has ruled.

Judge William Coleman ruled the Esso process achieves the same results as the Phillips process, but that it does so through different methods. Esso operates sulfuric acid alkylation plants at the Baltimore and Baton Rouge refineries, and the affiliated Humble Oil & Refining Co. operates a third unit at Baytown, Tex.

MID-CONTINENT

Expanding Field

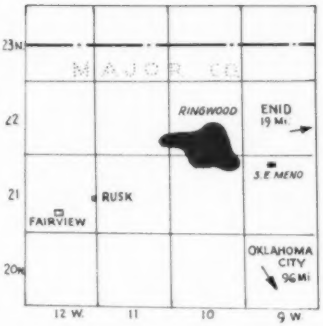
Ringwood now one of most active Mid-Continent areas

Neil Williams

ENID, Okla. — Expanding development in Ringwood field, in eastern Major County, western Oklahoma, has increased to 18 the number of drilling rigs now operating in the field, making this one of the most active spots in the Mid-Continent region.

Fifteen additional locations have been staked within the past 2 weeks on which drilling will be started as rapidly as rigs become available.

A succession of major extensions during recent months has spread the potentially productive area a distance of more than 5 miles from east to west and about the same distance from north to south at its widest points. With limits as yet undefined and the area only sparsely drilled, no early cessation of activity is in sight. Mounting offset requirements and lease obligations, occasioned by an accelerating well-completion rate, are expected to force the use of a still greater number of rigs.



Map showing location of Ringwood field

Twenty-four wells have been completed to date. Four others are in process of completion and due to be on regular production shortly. With the productive horizon at depths of from 6,750 ft. to 6,900 ft., additional wells are now being completed at an average rate of one per rig every 2½ to 3 months.

Although the field was opened in 1947, it has been only since the middle of this year that active development has been undertaken. Previously, with the discovery well having been drilled on a large block held almost solidly by Superior Oil Co., no more than two rigs had been operated at any one time. Up to this year, only eight wells had been completed, with development having been confined to a relatively small area around the discovery well.

Present drilling has been activated by numerous farm-outs which Superior, faced with lease obligations coming due, has made within recent months to various other operators.

Currently, seven operators are active in the field. A summary of their operations follows:

Operator	Wells completed	Rigs working	Active locations
Superior Oil Co.	9	5	7
Mazda Oil Co.	8	5	4
Stephens Oil Co.	1	0	0
Blackstone & Rowland	3	0	0
C. Andrade III	3	4	4
Champlin Refining Co.	0	2	0
Atlantic Refining Co.	0	2	0
Total	24	18	15

The field is being developed on a 40-acre unit program with a spacing pattern that will permit later redrilling to 20-acre units. The producing zone is a Pennsylvanian sand, designated locally as the Manning sand.

Pipe Liners' Convention

HOUSTON.—The Pipe Line Contractors Association isn't quite 2 years old, but last week its members held its second annual convention in the Shamrock Hotel here.

They elected Ray L. Smith, president of Ray L. Smith & Son, Inc., El Dorado, Kans., president, and named as vice presidents L. H. Favrot, president of Latex Construction Co., Houston, and E. G. Morrison, Morrison Construction Co., Austin.

N. A. Saigh, president of N. A. Saigh Co., San Antonio, was elected treasurer, and Richard A. Gump, Dallas, executive secretary.

Speaker at the association's banquet was R. Elmo Thompson, vice president and director of the First National Bank & Trust Co., Tulsa.

The association was formed in January 1948. The 1949 convention was attended by 175 representatives of the 32 members and associate members, some of whom are shown in the accompanying pictures. Members are the pipe-line contracting companies, and associate members are suppliers, subcontractors, and equipment dealers connected with the pipe-line contracting industry.

Ray L. Smith, new president of the Pipe Line Contractors Association, presents a gift to the retiring president, T. A. Hester

In the Pictures

1—Jim Suter, Frank G. Hough Co. (left), and Mitchel Deane, Browning-Ferris Machinery Co. (right), greet G. G. Griffis and Martin Wunderlich, partners in Wunderlich & Griffis Construction Co.

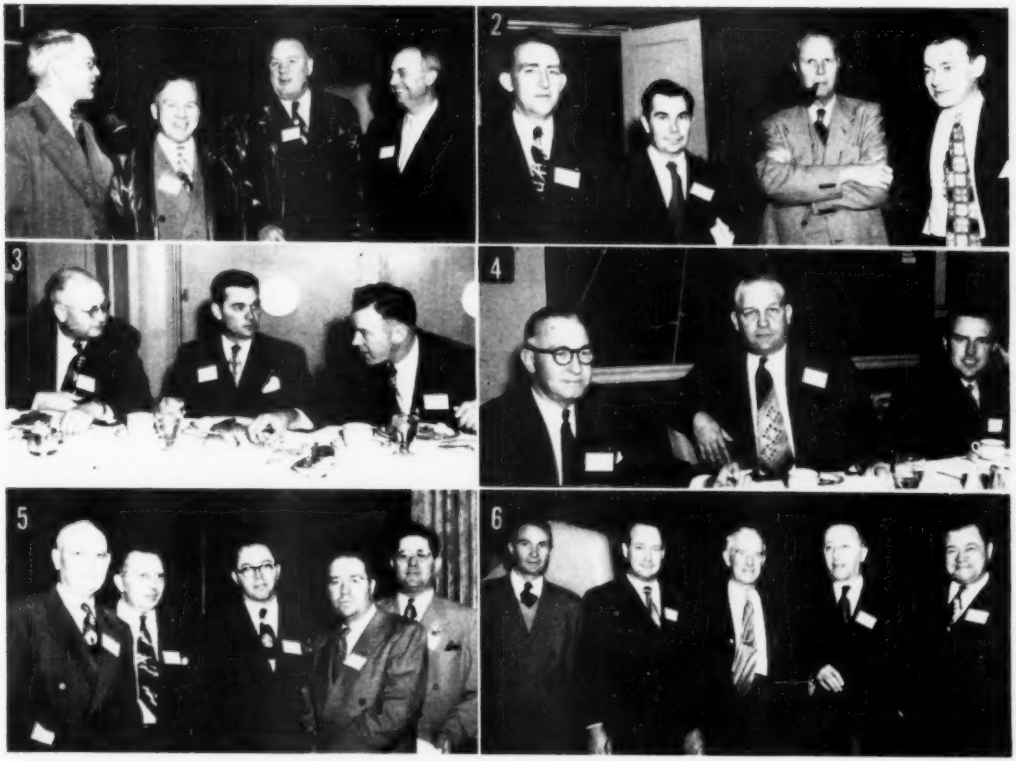
2—Entering the Shamrock Hotel exhibition hall are James H. Nolan, Sheehan Pipe Line Co.; R. B. Somerville, Somerville Construction Co.; Gene Rolfs, Crutcher-Rolfs-Cummings; and Robert Sheehan, Sheehan Pipe Line Co.

3—At the speakers' table for luncheon are Ray L. Smith, Ray L. Smith & Son; E. G. Morrison, Morrison Construction Co.; and Robert Thomas, O. C. Whitaker Co.

4—Seated at the luncheon are T. R. Jones, Oklahoma Contracting Co.; J. R. Horrigan, J. R. Horrigan Construction Co.; and Richard A. Gump, Pipe Line Contractors Association

5—Talking things over in the Shamrock lobby are Ray L. Smith, Ray L. Smith & Son; K. W. Kunert, Nagle-Hart Tractor & Equipment Co.; E. J. Mahoney, Jr., Mahoney Construction Co.; L. H. Favrot, Latex Construction Co.; and O. R. Smith, Smith Contracting Corp.

6—Visitors to the equipment exhibits included G. G. Brown, Browning-Ferris Machinery Co.; J. C. Johnson, L. E. Farley, Inc.; Roger Barlow, Browning-Ferris; N. A. Saigh, N. A. Saigh Co., Inc.; and G. A. Allman, L. E. Farley, Inc.



New Production High

October figures show foreign output at 3,643,600 bbl. daily; 18 per cent gain in Saudi Arabia is big factor

Dahl M. Duff

FOREIGN crude-oil production, exclusive of the Communist areas, reached a new high thus far this year in October with a total of 3,643,600 bbl. daily.

Slight increases in Venezuela and Kuwait and a marked gain of 18 per cent in Saudi Arabia were the major factors in the rise in the foreign total from September to October. The 3,643,600-bbl. daily figure is about 69,000 bbl., or 1.9 per cent, over the September total.

The world production total for October is estimated at 9,512,100 bbl. daily. This is 174,700 bbl. daily, or about 2 per cent, over the revised September figure. It includes United States output, which gained from 4,940,000 bbl. daily in September to 5,046,000 bbl. daily in October, as well as estimated production for Russia and Eastern Europe.

The total of foreign production has been upward since last June, as is shown in the accompanying table of the trend since the first of the year. For foreign production excluding Russia and Eastern Europe, the year's low was reached last March with 3,280,200 bbl. daily.

Despite the increase in Venezuelan production in October, the foreign total for the Western Hemisphere for the month was down nearly 10,000 bbl. daily. The 4,600-bbl. daily increase in Venezuela was offset by declines in Colombia, Canada, and Mexico.

Venezuelan production in October at 1,431,000 bbl. daily is another all-time high for that country. It is due to the heavy seasonal demand for the low-gravity fuel-oil crudes produced.

An even higher total is indicated in Venezuela for November. Weekly figures reported in the industry are: week ended November 7, 1,448,800 bbl. daily; week ended November 14, 1,459,500 bbl. daily; week ended

CRUDE-OIL PRODUCTION
(Thousands of barrels daily)

Country—	October	Previous month
Western Hemisphere:		
Argentina	67.0	66.7
Bolivia	2.2	2.5
Brazil	0.2	0.2
Canada	65.6	68.4
Colombia	78.7	84.2
Cuba	0.6	0.6
Ecuador	7.5	7.5
Mexico	171.0	176.7
Peru	41.0	41.0
Trinidad	57.5	57.6
Venezuela	1,431.0	1,426.4
Total	1,922.3	1,931.8
Europe and Africa:		
France	1.3	1.3
French Morocco	0.4	0.4
Germany	17.8	17.6
Italy	0.2	0.2
Netherlands	12.5	12.5
Egypt	44.0	43.1
United Kingdom	0.9	0.9
Total	77.1	76.0
Middle East:		
Bahrein	30.0	29.8
Iran	543.6	554.1
Iraq	106.4	108.0
Kuwait	261.7	247.4
Saudi Arabia	486.9	412.2
Total	1,428.6	1,351.5
Far East:		
British Borneo	72.0	72.0
Burma	0.6	0.6
China	1.5	1.5
India	5.3	5.3
Indonesia	125.0	125.0
Japan	4.2	4.2
New Guinea	4.8	4.8
Pakistan	2.2	2.2
Total	215.6	215.6
Total foreign less Russia & E. Europe	3,643.6	3,574.9
Russia & E. Europe:		
Albania	1.0	1.0
Austria	18.2	18.2
Czechoslovakia	0.9	0.9
Hungary	10.5	10.5
Poland	2.7	2.7
Romania	88.0	88.0
Russia	700.0	700.0
Yugoslavia	1.2	1.2
Total	822.5	822.5
Total foreign	4,466.1	4,397.4
Total United States	5,046.0	4,940.0
Total world	9,512.1	9,337.4

TREND SINCE JANUARY 1, 1949

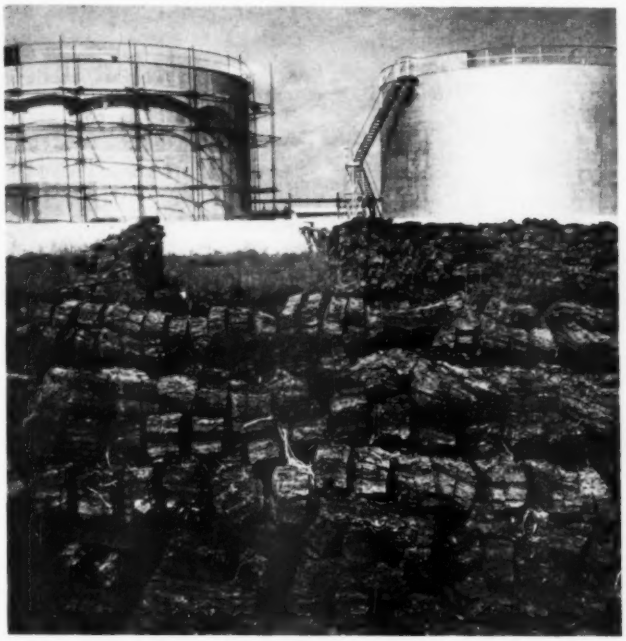
	W. Hemisphere less U. S.	Middle East	Foreign less Russia & E. Europe
January	1,706.4	1,358.2	3,308.6
February	1,688.6	1,400.2	3,340.2
March	1,625.9	1,393.4	3,280.2
April	1,678.2	1,485.2	3,448.3
May	1,768.5	1,417.6	3,472.8
June	1,768.8	1,375.7	3,433.3
July	1,800.2	1,338.7	3,428.1
August	1,859.9	1,323.9	3,473.1
September	1,931.8	1,351.5	3,574.9
October	1,922.3	1,428.6	3,643.6

The monthly production figures are accurate for all countries in the Middle East and the more important producing countries in the Western Hemisphere and Europe. In some other cases, estimates have been made based on the performance of earlier months. Figures in the column, "Previous month," do not agree in some instances with those heretofore published for September since revisions have been made due to later information. Data for Colombia and Canada excludes condensate. No up-to-date figures are available for Russia and the Communist-dominated countries of Eastern Europe, and here the information is in general the latest obtainable, reflecting what is believed to be the level of current production. Other figures in the tabulation are from official government or company reports.

VENEZUELAN PRODUCTION BY COMPANIES IN 1949
(Daily average in barrels)

	January	February	March	April	May	June	July	August	September	October	Average for 10 months
Creole	577,948	592,438	530,128	555,443	642,878	643,700	630,810	635,156	653,264	684,064	615,583
Shell	389,204	391,415	375,836	379,430	377,735	375,680	409,430	449,920	452,020	426,449	402,712
Mene Grande	177,001	149,171	145,545	159,743	164,750	163,819	144,709	168,413	180,072	192,211	164,543
Socony	32,077	33,029	33,946	34,512	35,234	35,194	36,875	37,791	38,279	36,799	35,374
Texas	21,095	16,257	24,174	22,102	21,398	21,506	24,646	20,272	24,928	27,603	22,398
Sinclair	17,672	17,485	16,759	15,962	15,580	15,408	14,633	14,216	13,734	13,552	15,500
Mercedes	15,169	14,501	15,025	15,345	15,574	15,145	15,259	15,398	15,969	15,774	15,316
Atlantic	10,154	8,791	9,220	9,024	10,009	10,409	11,946	12,146	12,920	13,622	10,824
Pantepec						3,301	12,470	12,154	11,772	11,811	5,151
Phillips	1,852	1,836	1,913	4,138	3,717	4,641	4,413	6,586	7,293	6,621	4,301
Richmond	1,777	2,536	1,786	3,247	3,921	6,104	11,469	4,860	5,061	1,272	4,203
British Controlled Oilfields	1,091	1,077	1,053	1,008	1,006	1,007	1,027	1,020	1,006	1,095	1,042
Guasare		144	61	159	132	94		98	118	138	94
Total	1,245,040	1,228,680	1,155,476	1,200,113	1,291,934	1,296,008	1,317,687	1,378,030	1,426,436	1,431,011	1,297,041

Ministry of Fomento data: These figures give lease or concession production by companies. They differ from operated production in the case of the larger companies which have joint interests and affiliations in various fields. Creole, for example, reported an operated production in October of 637,240 bbl. daily. Operated production reflects actual oil available to the company concerned.



THE OLD AND NEW.—Here awaiting shipment are one of the world's newest and one of its oldest fuels. The scene is in the Netherlands where Shell organization and Standard Oil Co. (N. J.) have developed Europe's largest field at Schoonebeek. The stacks in the foreground are peat. Farmers in the Schoonebeek area are among the last of the Dutch peat producers. The tanks in the background are for the 25°-gravity crude produced at Schoonebeek (Standard Oil Co. [N. J.] photo)

November 21, 1,476,000 bbl. daily; week ended November 28, 1,408,500 bbl. daily.

Of interest is the accompanying table giving production by companies as reported by the Venezuelan Ministry of Fomento. These figures show concession or leasehold production which for the larger companies differs from actual operated production. The data discloses the virtual shutdown of production of the heavy oil by Richmond Exploration Co. (Standard Oil Co. of California) in the Boscan area of Lake Maracaibo.

Colombian production was off more than 5,000 bbl. daily in October to 78,700 bbl. daily, according to government reports. Preliminary figures show another slight decline in November to about 77,300 bbl. daily. Unofficial information indicates Argentine production at about 67,000 bbl. daily is somewhat higher than previously reported. Canada suffers from temporary lack of outlet for its Northern Alberta operations.

Germany continues to be the outstanding feature in crude-oil production in Europe. Western Germany shows another postwar high in October with 17,800 bbl. daily, and German officials are predicting that output next year will rise to 1,500,000 tons (an average of 30,000 bbl. daily), after recent discoveries are further developed.

October production of 1,428,600 bbl. daily in the Middle East is the highest for this region since last April. Much of the gain is due to the increase in Saudi Arabia.

Saudi Arabian production has fluctuated widely since the first part of the year. Dollar shortage conditions throughout the Eastern Hemisphere have seriously affected operations in this country. Crude output fell to 412,200 bbl. daily in September but was back to 486,900 bbl. daily in October. The November report, since issued, shows a daily average of 454,500 bbl. in that month.

Aminco Test Spudded

American Independent Oil Co. has spudded its first well in the Kuwait-Saudi Arabian neutral zone. This test, one of a projected series of four, will be carried to a depth of about 5,000 ft.

Drilling crews and materials are housed on a converted LST which is anchored off the coast of the neutral zone, about 20 miles from the drilling site. The LST left Orange, Tex., October 1, and required 54 days for the trip to Kuwait. Drilling equipment was unloaded and transported to the well site in 14 days.

About 30 days will be required before results of this test are known. However, location of the well near the famed Burghan field in Kuwait makes its possibilities particularly good.

Britain to Cut Imports

A program to curtail imports of petroleum from sources requiring payment in dollars is being framed by the British Government, according to press dispatches this week, and there were reports that an order was being prepared to prohibit the importation of fuel oil and impose quotas on other products from dollar sources.

The action would affect principally three American-owned companies which are large importers into England: Vacuum Oil Co., Ltd., California Texas Oil Co., Ltd., and Anglo-American Oil Co., Ltd. Officials of the British ministry of fuel and power have been conferring with these companies in an effort to induce them to import more sterling oil and less dollar oil in order to reduce the drain on England's dollar exchange.

A reduction in shipments to England of dollar oil from South America and the Middle East would mean that more petroleum would seek markets in other parts of the world, probably chiefly in the United States.

WEST COAST

Oil Rights Purchased

LOS ANGELES.—One of the largest property transactions made in California in recent years has been completed by Shell Oil Co. In this sale Shell purchased oil rights to acreage comprising the Irvine Ranch, about 104 sq. miles of coastal land in Orange County, California.

Geophysical and mapping crews have been at work in the area for Shell for some time, and a core-drilling crew is moving in. Between 30 and 40 exploratory wells have already been drilled in the area, none of which has been productive.

The area in which Shell has interest extends along the coast from Newport Beach to Laguna Beach and inland about 10 miles. Most of the wells which have been drilled have been concentrated within about a mile of the coast near Newport field. Those near the coast have been bottomed in Miocene formations, those farther from the coast are in the Pico (Pliocene), and near the 10-mile

boundary are bottomed in the Pico or Repetto.

The majority of the holes have been drilled to 4,500 ft. or less although one has reached 6,070 ft. Geology at this depth is not known.

Better Facilities

West Coast firms improving, building storage, terminals

CONSTRUCTION and modernization of storage and marine-terminal facilities along the Pacific Coast continues at a high rate. Latest project to be announced is the modernization by General Petroleum Corp. of its Islais Creek storage terminal at San Francisco.

Improvements include construction of 17,000 bbl. of new storage. The new tanks consist of four 3,200-bbl. and two 1,700-bbl. floating-roof tanks.

In addition the pipe layout will be rehabilitated and a new loading rack constructed. Total cost is approximately $200,000.

The plant will be supplied by barge from the company's main terminal in Oakland. It will provide petroleum product storage for the San Francisco area and for peninsula points as far south as Redwood City.

Shell Oil.—At Tacoma, Shell Oil Co. has completed construction of a new waterfront terminal. This is part of the company's $6,000,000 West Coast expansion program.

At the new plant Shell has consolidated all receiving, packaging, and distributing facilities for Tacoma and a large portion of southern Washington.

Standard.—At Seattle, Standard Oil Co. of California has begun modernization of its main bulk storage plant and packaging warehouse. An earlier part of this program, the expansion of the Point Wells marine terminal, is now completed.

Construction at Seattle includes 22 new tanks and will raise the company's storage capacity in that area to 154,000,000 bbl. A 65,000-sq. ft. warehouse, a new dock, garage, boiler house, and pump house will be built.

Joint project.—In the Long Beach area, General Petroleum, Standard Oil, and Union Oil are replacing wooden wharves with new reinforced concrete wharves. The new installations will rest on asphalt-impregnated concrete piles.

These consist of a dense concrete center core encased in a porous concrete jacket. After the pile is heated and dried under a vacuum, hot asphalt is applied under pressure.

The engineering department of General Petroleum Corp. is handling engineering and construction problems for all three companies.

Pattern for Proration

LOS ANGELES.—A new type of crude-oil purchase contract, designed to cause a curtailment of production, is being offered independent producers by Standard Oil Co. of California.

Instead of the former practice of buying total output, the new contracts offer to purchase a percentage of the production of each well or lease. The exact figure has not been made known, but is understood to be in the neighborhood of 80 to 90 per cent.

This action was forecast last June when Standard gave 6 months' notice of cancellation of all crude-purchase contracts. Following expiration, contracts were on a day-to-day basis.

The company stated that the step is taken in an attempt to bring production into line with demand for petroleum products. California output is said to be in excess of the present demand and stocks are increasing.

SOUTHWEST

Scurry Trend Spreads

Discoveries in Kent County to north and Borden County to south greatly enlarge Canyon reef potentialities

D. H. Stormont

DALLAS. — Southwestern Kent County this week moved into the limelight which during recent months has been focused on its neighbor to the south, Scurry County.

Cause for the shift in attention is the prospective Canyon reef discovery, 8 miles northeast of Scurry's northernmost reef oil producer.

The potential pool opener, J. A. Chapman Producing Co. 1 D. M. Cogdell, on a 3-hour drill-stem test at 6,799 ft. to 6,839 ft. in 10 minutes reportedly showed gas estimated at 400,000 cu. ft. per day. In 3 hours it filled 4,226 ft. of drill pipe, or at an estimated rate of 57 bbl. per hour. No water was shown on the test. Flowing pressure was 200 to 600 psi., and shut-in pressure after 15 minutes was 2,300 psi. On Monday the operator was running 7-in. casing.

Reported top of the Canyon reef was 6,796 ft., or at the subsea depth of about 4,365 ft. Hole was first bottomed at 6,819 ft., the last 5 ft. of the 23-ft. section drilling in 2 minutes. On a ½-hour drill-stem test at this depth some 900 ft. of drilling fluid, 186 ft. of free oil (40° A.P.I. gravity), and 714 ft. of oil-cut mud were recovered. Hole then was drilled to present total depth of 6,839 ft. where the second test was made.

Located in Section 716, Block 97, H&TC Survey, and about 1 mile from the Scurry-Kent county line, the 1 Cogdell appears to be on the same reef trend as the Scurry reef fields.

Northernmost wells in North Snyder, which is the most northern of the Scurry fields, indicate that its productive limits may not extend much farther to the northeast. But reef characteristics being what they are, the reef mass could again build up and be oil productive further to the northeast. Only actual drilling will prove how much of the 8-mile intervening area is oil productive.

Southward, too. — This development followed closely on the heels of Amarada Petroleum Corp.'s Canyon reef discovery in Borden County, 4 miles southwest of production on the other end of the Scurry reef fields. Flowing tests made through casing at the end of last week indicated the Amarada well, its 1 Von Roeder, will make a commercial producer in the reef.

It is, of course, much too early to predict what will be proven by the drilling of additional wells in the intervening areas at either end of the Scurry reef fields. They may mark new trends of reef production, or they may be a continuation of the Scurry trend with gaps in production. One thing is certain, however: these developments are not having a slackening effect on reef exploration in West Texas.

Within the Scurry fields proper last week there were 125 rigs at work plus an additional 17 rigs on wildcat and step-out locations. Locations and completions continue to mount steadily as more rigs are brought into the four reef fields of North Snyder, Kelly, Diamond-M, and Sharon Ridge, now generally accepted as being a common reservoir. With about 250 wells now completed, total daily production from these fields is approximately 29,000 bbl. daily.

Gasoline plants planned. — Actual plans for the construction of natural-gasoline plants have not yet been announced but it is known that at

least two plants are in the drafting stage. Lion Oil Co. is planning a 566-well plant to take gas from the Diamond-M and Sharon Ridge area, probably of about 40,000 M.c.f. capacity, and is expected to announce the project about the first of the year.

In the North Snyder portion, Barnsdall Oil Co. has completed a survey and is planning the construction of a plant about 26,000 M.c.f. in size. This plant probably will be jointly owned, with Barnsdall serving as operator.

While the gas-oil ratio of these Scurry reef wells is low, the liquid hydrocarbon content of the gas is exceedingly high. Gas analyses made by one company indicate that more than 6 gal. of propane and heavier products per 1,000 cu. ft. of gas may be recovered if producers conduct their operations to secure a stabilized crude.

Because the crude is undersaturated, with a shrinkage factor of about 1.5, the amount of condensable hydrocarbons which will be recovered will depend to a great extent on how operators handle their crude.

For example, an analysis of the gas from a 500-psi. separator showed a propane-plus content of 2.5 g.p.m. and that from a 140-psi. separator, 4.4 g.p.m. But if the separator pressure is reduced to around 20 psi., analyses showed the propane and heavier content increases to around 8 g.p.m.

Pipe lines.—To take the residue gas when it becomes available, Lone Star Gas Co. is extending its transmission system from Snyder into the field. Currently the company is laying a 12-in. line for this purpose.

Not only is the gas from these reef fields very desirable, but so is the 43 -45 A.P.I.-gravity crude. Analyses of this Scurry crude, which is fairly low in sulfur content, reportedly showed a gasoline content of about 47 per cent with less than 10 per cent residuum.

Currently all Scurry reef oil production is being handled through facilities of Magnolia Petroleum Co. and Pasotex Pipe Line Co., a Standard Oil Co. of Texas subsidiary. Magnolia is gathering around 21,000 bbl. daily and moving it through a new 8-in., 25-mile line to its main-line station at Iatan. Pasotex is gathering the remainder, about 9,000 bbl., and moving it through a new 6-in. line to Hermleigh where it enters the main line of Basin Pipe Line Co. Pasotex, however, is reportedly planning to duplicate its line with another 8-in. line.

Turbine Drilling Tests

DALLAS.—Performance of the Edco turbodrill in relatively deep drilling is soon to be tested at two coastal wells in southwestern Louisiana.

At these two wells, one at Creole in Cameron Parish and the other in the Iowa field of Calcasieu Parish, the new-type tool will be used to drill from below the surface pipe at around 2,000 ft. to a depth of 10,000 ft.

The surface hole will be drilled with conventional rotary tools; the 12¼-in. turbodrilled hole will be in keeping with conventional hole-size and casing programs of the two fields. These two operations, one of which is expected to be under way by the first of the year, will be the first deep tests for the Edco turbodrill. Last August at Golden Meadow, on the Louisiana Gulf Coast, the turbodrill method was used to cut a 13-in. hole from 1,242 ft. to 3,248 ft. *(See The Oil and Gas Journal, page 161, September 22, 1949).*

This 2,006 ft. of hole was cut in a total elapsed time of about 24 hours, or at the rate of 77 ft. per hour. Some hole was made at the rate of 720 ft. per hour, but actual net drilling time averaged 120 ft. per hour. These penetration rates, if not the fastest, certainly rank among the higest ever achieved in Gulf Coast drilling.

The two new tests, as was the Golden Meadow run, will be made with a 10¼-in. o.d. turbine drill. Developers of the drill, Engineering Development Co., Dallas, expect to have a smaller turbodrill available by the middle of 1950. The new drill will be capable of drilling with bits as small as 8¾ in.

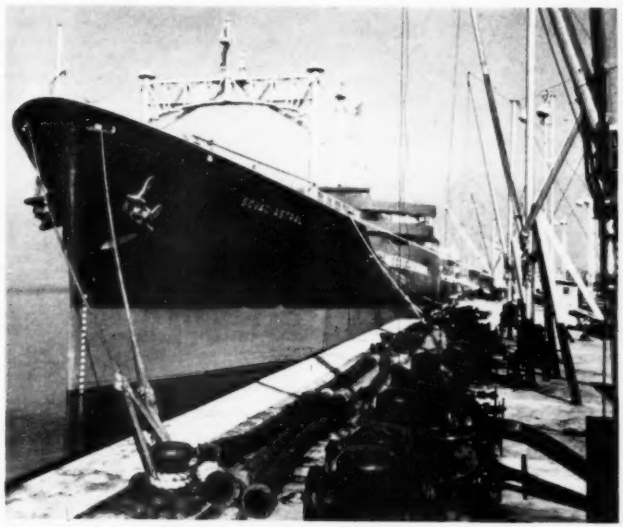
Tax Experts Confer

FORT WORTH.—Problems of government should be solved on the local level, the annual ad valorem tax forum of the Mid-Continent Oil and Gas Association here December 14-16 was told.

Opening the conference of more than 150 tax experts from oil companies throughout the country, H. F. Harrington, tax counsel of The Texas Co., Houston, attacked usurpation of private initiative by either local or national government, and urged opposition to all programs threatening to increase government spending.

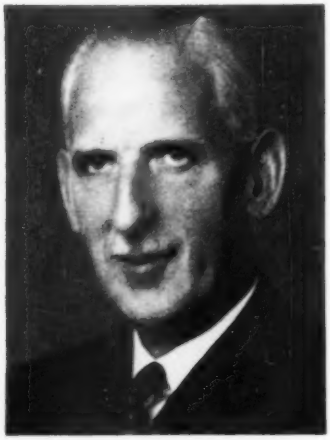
Features of the meeting were a symposium on state and local taxation and reports on special tax situations.

J. W. Elder, head of the tax division of Ohio Oil Co., Findlay, was named chairman of the conference for next year, succeeding C. D. Gallamore, Tide Water Associated Oil Co., Tulsa. Jack McDonough, Superior Oil Co., Houston, was named vice chairman.



***BIG TANKER.**—With a capacity for carrying 228,000 bbl. of oil, more than the 225,000-bbl. daily output at Humble Oil & Refining Co.'s Baytown refinery, the largest in the world, the Sovac Astral is shown here as it tied up at the Humble Docks on the Houston Ship Channel at Baytown, Tex. The 26,000-ton tanker is one of the largest in the world, being one of a fleet of sister ships owned by Socony-Vacuum Oil Co., Inc. It measures 82½ ft. wide and 626 ft. long, has a 32-ft. draft, and will make 16 knots. It was built by the Sun Shipbuilding & Drydock Co. at Chester, Pa. The supertanker stopped at Baytown for a partial cargo before continuing on its maiden voyage from Philadelphia to Panama*

PERSONALS



Industry Leader

Sir William Fraser is British oil veteran

SIR WILLIAM FRASER, chairman and managing director of Anglo-Iranian Oil Co., Ltd., was literally born and bred in the petroleum industry, of which he has become one of the world's leading figures.

Son of the late William Fraser, founder and managing director of Pumpherston Oil Co., he was born at Glasgow November 3, 1888. He was educated at Glasgow Academy and the Royal Technical College, Glasgow. He succeeded his father as joint managing director of the Pumpherston company on the latter's death in 1915.

He was created a Commander of the British Empire in 1918 for war services. The same year he established a joint selling organization for the Scottish shale-oil industry and this was followed in 1919 by the creation of Scottish Oils, Ltd., to coordinate the producing and marketing interests of the Scottish shale-oil companies under Anglo-Persian Oil Co. (as Anglo-Iranian was named until 1935). He became a director of the latter company in 1923, deputy chairman in 1928, and succeeded the late Lord Cadman as chairman June 24, 1941.

Among the highlights of his business career are the formation in 1931 of Shell-Mex. and BP, Ltd., and later of Consolidated Refineries, Ltd. In 1934, he conducted the negotiations which led to the joint formation with Gulf Oil Corp. of Kuwait Oil Co., Ltd.

During and immediately before the last war, Sir William was closely concerned in British Government plans for oil supplies. In 1944 he was a member of the British Oil Delegation to explore possible bases for an Anglo-U. S. oil agreement. He has been honorary petroleum adviser to the British War Office since 1935, and was knighted in 1939 for his public services.

In 1946, Sir William was the first recipient of the Cadman Memorial Medal of the British Institute of Petroleum. In addition to his directorships in the Anglo-Iranian group of companies, he is on the boards of Iraq Petroleum Co., Ltd., Burmah Oil Co., Ltd., and Kuwait Oil Co., Ltd.

Louis Desjardins and **P. H. Blanchet** have formed a partnership as consulting photogeologists and photogrammetrists in Houston. Desjardins formerly was in charge of photogeological work with Creole Petroleum Corp. in Venezuela for several years, and Blanchet held a similar position with International Petroleum Co. in Peru. They were associated previously in photogeological work as employes of Imperial Oil, Ltd., on the Canol project in Canada during wartime.

Charles R. Miller, Detroit, products engineer for the White Star division, Socony-Vacuum Oil Co., Inc., was recently elected a district governor of Rotary International, for 1949-50. He will coordinate activities of 75 Rotary Clubs in Michigan and Ontario.

Tom Cline, drilling superintendent for Barnsdall Oil Co., has been transferred from Shreveport to the Oklahoma and West Texas area, with headquarters in Oklahoma City.

H. Dean Murray, formerly district petroleum engineer for The Texas Co. at Midland, Tex., recently resigned to become affiliated with **W. H. Crenshaw** in the Midland company of American Inspection Service.

Jesse E. McGee, formerly assistant superintendent of construction and maintenance in the Tennessee division, Pan American Petroleum Corp., has been promoted to assistant manager of operations at New Orleans. He has been with Pan American since 1925.

Louis E. Schneider, geologist at Rankin, Tex., for Atlantic Refining Co., has been transferred in a similar capacity to the Midland, Tex., office.

C. O. Magee, mud engineer for Humble Oil & Refining Co. at New Orleans, has been transferred to Katy, Tex., as associate gas engineer.

H. E. Bramston-Cook has been elected a vice president of Oronite Chemical Co., subsidiary of Standard Oil Co. of California, San Francisco.

John S. Hacker, district engineer, Pickton gas plant construction district, Humble Oil & Refining Co., has been transferred to the East Texas division office at Tyler as senior engineer. Other transfers include: **Clifton Roy Crim,** engineer at the Tomball Gas plant construction district, moved to the Colorado City district, West Texas division; and **E. E. Newnham,** tool pusher in the Pickton district, moved to the Hobbs district. Newnham will be replaced by **J. W. Baucum,** who is now tool pusher of the Friendswood district, Gulf Coast division.

New officers of the Petroleum Engineers Club of Dallas, who were elected recently. Left to right: Dr. H. B. Renfro, of the firm of J. B. Stoddard, secretary-treasurer; A. E. Caraway, Lufkin Foundry & Machine Co., third vice president; G. R. Brainard, Jr., Seaboard Oil Co., second vice president; Henry J. Gruy, DeGolyer & MacNaughton, president; Edward C. Cram, Magnolia Petroleum Co., first vice president; and T. S. Bacon, Lon Star Gas Co., retiring prexy

W. L. Ballou, general foreman at Stamps, Ark., for Barnsdall Pipe Line Co., has been transferred to Placedo, near Victoria, Tex., where he will serve as maintenance foreman.

L. M. Kirkpatrick, assistant engineer, United Gas Pipe Line Co., has been transferred to the geophysical department as geophysical computer. Other changes include: **S. A. Womack, Jr.,** geological scout, transferred from the general office, geological department, to Shreveport district as scout; **D. R. Perry, Jr.,** assistant petroleum engineer, production-engineering department, transferred to the Shreveport district in the same capacity; **W. F. Ellis,** assistant petroleum engineer, Shreveport district, transferred to the general office production engineering department; and **H. M. Crowell,** crew foreman, Dallas district, transferred to the Southwest Louisiana district as section foreman.

Dr. Ionel L. Gardescu and **Curtis Morris** have been elected vice presidents of Transcontinental Gas Pipe Line Corp. Gardescu, authority on natural-gas reserves, joined the company early in its history as head of the gas-reserve department. Morris was formerly with the East Texas Chamber of Commerce before joining Transcontinental in April.

I. L. GARDESCU *CURTIS MORRIS*

Frank C. Kallina has joined Lockhart Oil Co. as assistant Texas manager at Corpus Christi. He was formerly geologist with Cam Corp.

J. A. Neath, vice president, Humble Oil & Refining Co., has been elected vice president of the Houston Chamber of Commerce for 1950. Others elected include: **John C. Flanagan,** vice president and general manager, United Gas Corp., treasurer; **Ralph Neuhaus,** vice president, Hughes Tool Co., secretary of the board of directors. **E. D. Cumming,** regional vice president, Shell Oil Co., and **William J. Goldston,** president of the Goldrus Drilling Co., were elected to the board of directors.

Newly elected officers of the West Central Texas Oil and Gas Association. Left to right: Lester Clarke, Breckenridge, second vice president; French Robertson, Abilene, president; and J. C. Hunter, Abilene, first vice president. The new officers were chosen during the association's recent annual meeting in Abilene

William A. Berryman, vice president of Gulf Oil Corp., will assume direction of the firm's foreign marketing operations, succeeding **B. P. Newton,** vice president in charge of foreign operations, when Newton retires December 31. Berryman will be assisted by **F. C. W. Paton,** who has been appointed assistant to the vice president, and by **R. F. Temp** and **James H. Mayes,** who have been appointed Eastern Hemisphere and Western Hemisphere representatives, respectively, of the foreign marketing department.

Frank M. Brooks, a director and manager of the geological, land, and production department, El Dorado Refining Co., was recently elected president of the Kansas Geological Society, succeeding **Don W. Payne,** Sinclair Oil & Gas Co. Other officers include: **Joseph R. Clair,** Great Lakes Carbon Co., vice president; **Ralph Ruwe,** Stanolind Oil & Gas Co., secretary-treasurer; and **Don Allen,** of Westgate-Greenland Oil Co., director.

W. N. Little, division engineer for Tide Water Associated Oil Co. at Midland, Tex., has been elected chairman of the Permian basin section, American Institute of Mechanical Engineers, succeeding **Thomas Frick,** division operations superintendent for Atlantic Refining Co., Midland. **C. M. LaLonde,** assistant superintendent of the West Texas district, Phillips Petroleum Co., at Odessa, Tex., was named chairman of the group.

Malcolm James has been named to the combined positions of chief scout of the Gulf Coast division, and district landman of the Beaumont district, Gulf Coast division, for Sun Oil Co. He has been with the firm since 1926. He was made chief scout for the Gulf Coast area in 1948.

CHARLES U. BAY

Charles U. Bay will resume duties as president of Bay Petroleum Corp. on January 1, replacing **Gordon R. Kay,** who resigned to become president of Morton Oil Co., Casper, Wyo. Bay formerly held the position of president and is chairman of the board of directors. He will not be actively engaged in the management of the firm during his present government service, however, but the company will be directed by a management committee, of which **Leo L. Leabo,** vice president, will be chairman. Other executives making up the committee are: **Charles O. Garbrecht, Halleck I. Craig,** and **Dolphe E. Simic,** all vice presidents; and **Dent N. Hand,** secretary-treasurer.

David D. Irwin, Chicago, vice president of transportation and supply for Pure Oil Co., will relinquish his full-time responsibilities with the firm on January 1, but will continue in an advisory capacity. His duties will be assumed by **Kenneth A. Covell,** assistant vice president of transportation and supply.

C. R. Noll has been named director of automotive-products engineering for the newly created product development and product-engineering sec-

PERSONALS

Pictured here are six of the new officers of the Gulf Coast Section (Houston) of the American Institute of Mining and Metallurgical Engineers. Back row, left to right: E. B. Miller, Tide Water Associated Oil Co., director; E. R. Rassinier, Phillips Petroleum Co., director; A. G. Gueymard, City National Bank, secretary-treasurer; J. E. Kastrop, Gulf Publishing Co., section delegate. Front row: E. L. Petree, Gulf Oil Corp., chairman; and A. B. Stevens, Texas A. & M. College, vice chairman. Officers not pictured are: C. D. Robertson, Shell Oil Co., vice chairman; George Fancher, University of Texas, vice chairman; L. V. Uhrig, Humble Oil & Refining Co., director; Owen Thornton, The Texas Co., director; and Fred Nelson, Texas Gulf Sulphur Co., director

tion, Gulf Oil Corp. Others named include: **W. B. Shirk,** to direct industrial-products engineering; **C. J. Livingstone,** named director of product development; and **S. C. Levens,** appointed administrative assistant to **H. P. Hobart,** vice president who heads the new division.

R. P. Morrow, formerly refinery-maintenance engineer at Socony-Vacuum Oil Co., Inc.'s, Atlas Works, Buffalo, has been appointed staff engineer. He is succeeded by **C. H. DuBois** whose former position as inspection and corrosion engineer will be filled by **M. G. Christie.**

E. Owen Scott, geologist for Warren Oil Corp. at Corpus Christi, has been transferred in the same capacity to the Midland, Tex., office.

Elmer W. Pollock, Tulsa, has resigned as a vice president and assistant treasurer of Deep Rock Oil Corp., and will enter the insurance field. He formerly was with First National Bank & Trust Co., Tulsa, before joining Deep Rock.

George B. Hamilton, formerly a member of the Technical and Research division, The Texas Co., New York, has been appointed chief chemist at the new Puerto La Cruz refinery of Venezuela Gulf Refining Co., jointly owned by Gulf and The Texas Co.

Raymond H. Weaver has been appointed chief scout for the Southwest Production division, Sun Oil Co., succeeding **John H. Langston,** who is transferring to the Dallas office.

Burl S. Watson, president of Cities Service Oil Co. (Pa.), has been named to lead the heavy industries of New York in the 1950 Red Cross Fund campaign.

Len Little, Standard Oil Co. of California, retired; **F. F. Hill,** Union Oil Co. of California, retired; **W. R. Guiberson,** of W. R. Guiberson Co.; and **W. L. McLaine,** General Petroleum Corp., retired, were honored recently with scrolls expressing appreciation of their services to the Petroleum Production Pioneers, during the past 5 years. All are honorary past presidents of the organization.

Louis H. Haring, Jr., formerly senior geologist for Stanolind Oil & Gas Co. at San Antonio, Tex., has opened a consulting office in that city.

SHIFTS

B. H. Ullom, superintendent, Penrod Drilling Co., Marksville, La., to Colorado City, Tex.; **Louis R. Records,** engineer, Sohio Petroleum Co., Lake Charles to Jennings, La.; **Carl A. Benson,** superintendent, Phillips Petroleum Co., Minden, La., to Bartlesville, Okla.; **James C. Craig,** superintendent, Continental Oil Co., New Orleans, La., to Houston, Tex.; **T. W. Kane,** superintendent, Phillips Petroleum Co., Smackover, Ark., to Corpus Christi, Tex.

DEATHS

Lord Verulam, 69, chairman of Sterns, Ltd., and Sternol, Ltd., British oil companies, died recently in Newmarket, England, following an automobile accident.

George B. Arnot, 78, retired manager of the New York office of South Penn Oil Co., died December 12 in Spring Valley, N. Y.

R. A. Tyree, 62, oil and gas producer who operated as B. M. Tyree, died recently in Racine, Ohio. The business will continue to be conducted by his wife, B. M. Tyree.

Elmore Abram Willets, 88, a pioneer producer in Pennsylvania and New York fields who was president of the State Bank of Belmont, N. Y., died in Pittsburgh December 12.

T. C. Harwell, 69, Beaumont, Tex., with Houston Oil Co. for 20 years, died December 7.

Harvey Hardison, 54, Midland, Tex., petroleum engineer, died December 8.

Adolphus Rutherford Jackson, 56, engineer, Houston Pipe Line Co., Houston, Tex., died December 8.

Bayard H. Waterbury, 62, superintendent of Wolf's Head Oil Refining Co., Reno, Pa., died in Oil City, Pa., December 15.

James G. Springfield, 56, with Humble Oil & Refining Co. at Baytown, Tex., died December 15.

John Gaston, 51, Greenwich, Conn., oil operator, died in Hollywood, Calif., December 13.

John Thomas McAdams, 64, veteran Texas and Louisiana oil man, died December 8 at Liberty, Tex.

Richard H. Jones, retired early-day oil-field driller, died in Tulsa, December 14.

George Watts, 70, former assistant superintendent of the marine department of Sinclair Oil Co., died December 9 in New York.

INTERNATIONAL OIL

EXPLORATION.—The search for new oil was carried on over a broader front than ever before, with still greater activity in prospect for 1950. Among the significant discoveries were: the Basrah area of South Iraq; Vera Cruz in Mexico; Eastern Venezuela; Alberta province of Canada; Persian Gulf area of Saudi Arabia; natural gas in Arctic Alaska. Proven reserves exclusive of the United States totaled 51,800,000,000 bbl., an increase of 1,460,000,000 bbl. for the year. Most of the increase is accounted for by upward revisions in the older fields.

DRILLING.—Number of active rigs declined in midyear due principally to lessened activity in Venezuela. Decline leveled off toward end of year and upturn expected in 1950. Venezuela leads in number of active rigs, followed by Canada, Mexico, and Trinidad. Small increase in Middle East activity.

PRODUCTION.—Exclusive of the United States and Russian-dominated countries, production this year will average an estimated 3,433,000 bbl. daily, a new record and a gain of 10.2 per cent over 1948. Venezuela, which ranks first, had small decline while Persian Gulf increase was 20 per cent. World output owing to decline in United States will be slightly less than in 1948. The largest percentage and most significant gain in the Western Hemisphere was in Canada.

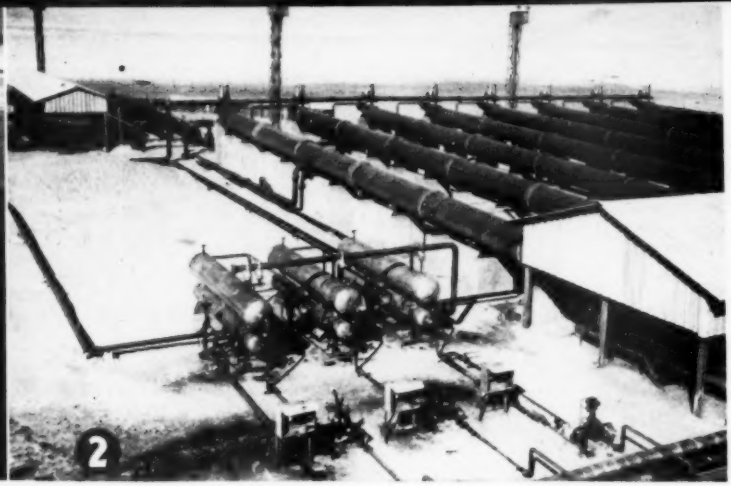
REFINING.—Greatest expansion program under way will continue through 1950 and later. New refineries now on stream and new plants under construction will add 175,000 bbl. daily to capacity in Venezuela at cost of nearly one-half billion dollars. New plants and expansion of old will give Western Europe, including United Kingdom, a capacity approaching 1 million barrels daily by 1952. World capacity including United States totals 10,544,675 bbl. daily.

TRANSPORTATION.—Pipe-line mileage completed this year totaled 2,650 miles. Principal crude-oil lines were Iraq-Lebanon, and new system in Bolivia. The largest natural-gas line was the 1,000-mile system in Argentina. New lines in 1950 will exceed 1949 record. Tanker capacity now totals 25 million deadweight tons credited to 1955 vessels with United States leading, followed by British Empire and Norway. Large additional construction under way or on order.

A SPECIAL SECTION PRESENTED BY THE OIL AND GAS JOURNAL

Oil's Dominion

Is World Wide



Oil's Dominion

THESE two pages and the following two reflect the largest and most widespread construction of new facilities, outside the United States, in the history of the petroleum industry. Rehabilitation from the war's destruction is still under way in some parts of the Eastern Hemisphere but the new work for the most part represents the application of entirely new programs which will continue through 1950 and later. Outstanding is the fact that the rapid expansion includes every phase of petroleum operation.

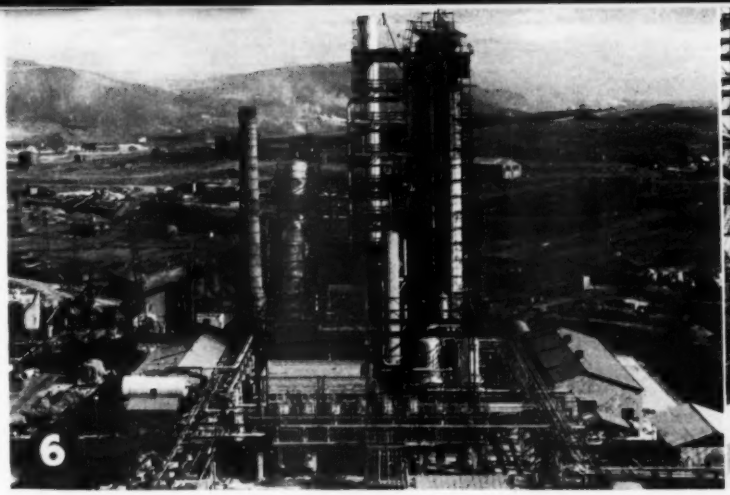
1—This modern four-berth loading dock serves the Bahrein Island (Persian Gulf) refinery of Bahrein Petroleum Co., Ltd., whose crude-oil capacity was expanded to 150,000 bbl. daily this year

2—General view of separators used in Bergan field of Kuwait Oil Co., Ltd., in Kuwait. This unique operation, similar to that in other parts of the Middle East with large output per well, serves the field which is now credited with having the largest proven reserves of any single area in the entire world

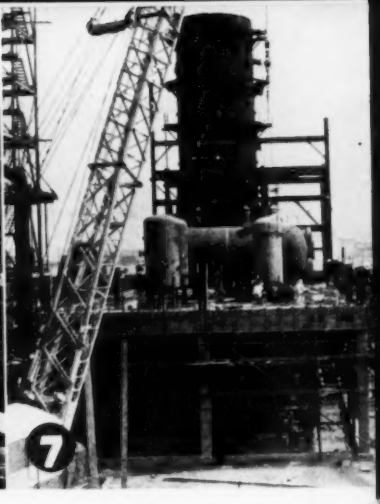
3—Portability of all equipment is stressed in the Saudi Arabian operations of Arabian American Oil Co. Here is a standard 130-ft. derrick moving across the Saudi Arabian desert on rubber tires

4—One of the pipe-line systems which terminates at Puerta La Cruz in Eastern Venezuela, rapidly becoming one of the largest oil ports of the eastern hemisphere. This line belongs to Mene Grande Oil Co.

5—Large absorption plant belonging to Shell interests under construction in La Paz field in Western Venezuela



6—*New crude distillation unit at the Llandarcy, U. K., refinery of Anglo-Iranian Oil Co., Ltd.*

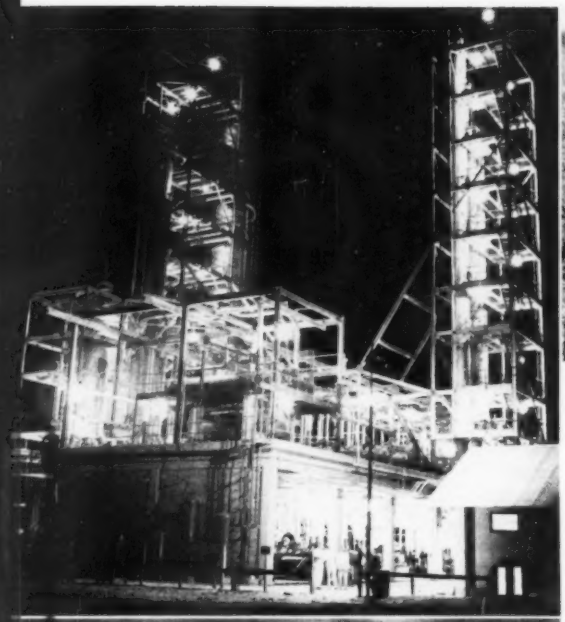


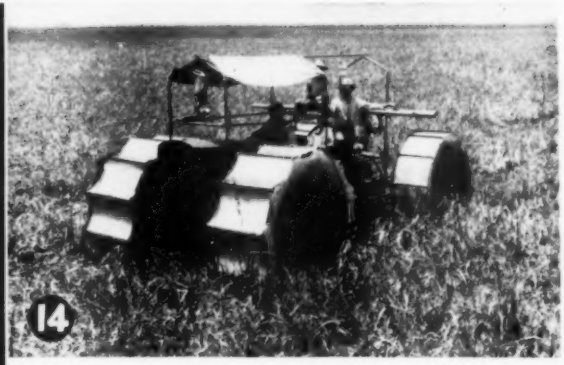
7—*Installation of this large catalytic cracking unit is now nearing completion at the Abadan, Iran, refinery of Anglo-Iranian Oil Co., Ltd., largest refinery of the entire petroleum industry. This is the first catalytic cracker installed at this refinery*

8—*Introducing Abdulla bin Rebirha, the fastest Arab welder on the 30-31-in. pipe line under construction in the Middle East by Trans-Arabian Pipe Line Co. The Arabs have proved apt pupils and are giving their American coworkers tough competition. All but stringer-bead welding on this big-inch project is now being done by Arabs*

9—*Here a corroded pipe line is being repaired by welding a sleeve on the line of Colon Development Co., Ltd., near La Solita in Venezuela. Venezuelans are doing the work*

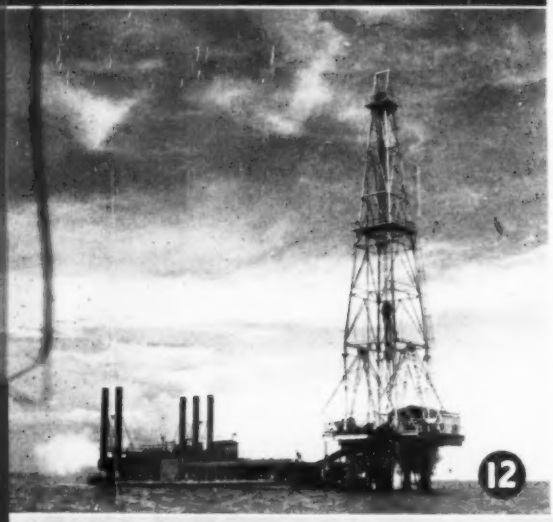
10—*The task of rehabilitating and enlarging distributing facilities in France is rapidly being completed. This pipe line at the port of Le Havre helps make the area one of the largest distributing centers in France*





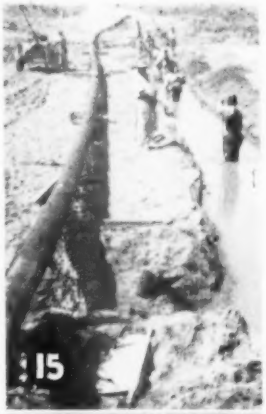
Oil's Dominion

11—The remote Paraguayan peninsula in Venezuela is to become one of the world's large refining centers with completion of the two major refineries of Shell Oil Co. of Venezuela, Ltd., and Creole Petroleum Corp. This shows one of the new Shell distillation units at Cardon



12—One of the latest-type drilling-barge units connecting to a permanent derrick structure in operation for Creole Petroleum Corp. in Western Venezuela

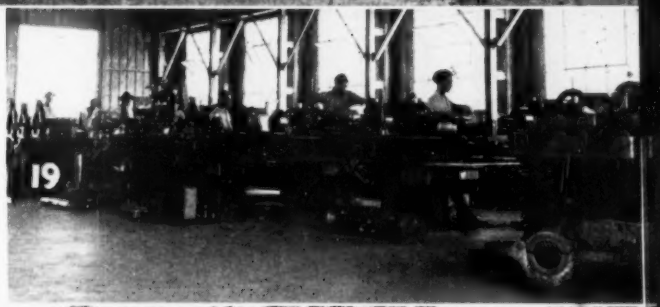
13—The U. S. Navy's 4-year effort to find oil in Arctic Alaska on its 35,000-sq. mile reserve has resulted in the completion of one gas well which is now supplying fuel for the main operating camp at Point Barrow. Taking advantage of the snow, winter trains are now moving to new locations for 1950 operations



14—This exploration crew with its marsh buggy is operating in the swampy regions along the Guanipa River near the Gulf of Paria in Eastern Venezuela

15—The Argentine Government Gas Service Department is completing the first major natural-gas pipe-line in South America connecting Comodoro Rivadavia field to Buenos Aires

16—The Turkish Government's efforts to make that country self-sufficient in oil have met with initial success over the past year. This topping plant, located at Batman, is approximately 15 miles from the new field at Ramanday



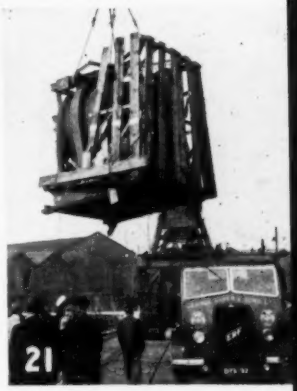
17—Interest in oil, starting with exploration, is on the upgrade in Japan. Here a laboratory technician for the Imperial Oil Co. is examining fossils at the company's Tokyo laboratory

18—This oil field in New Guinea was discovered prewar (World War II) but it was not until the past year that a pipe line was completed so it could be made available in the markets of the Far East. The operation is being carried on by a unit of Standard-Vacuum Oil Co., Inc.

19—Venezuelan operators in a shop of the Socony-Vacuum Oil Co., Inc., at its Anaco camp

20—A subsidiary of Standard-Vacuum Oil Co. is installing these prefabricated houses in South Sumatra

21—Anglo-American Oil Co., Ltd. (Standard New Jersey), has started construction of a 120,000-bbl. complete refinery at Fawley, England. It will be the largest in Europe. In this picture a concrete mixer is being unloaded at the Southhampton docks for construction work

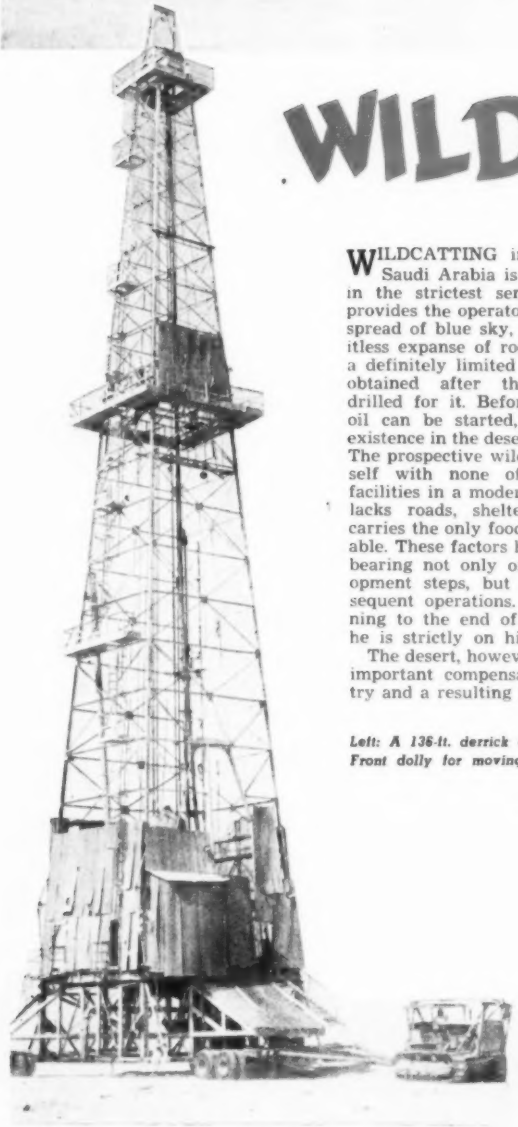


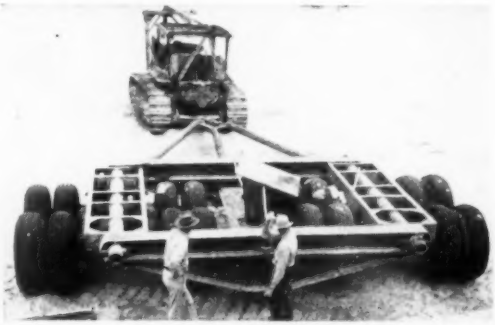
WILDCATTING

WILDCATTING in the deserts of Saudi Arabia is a pioneering job in the strictest sense. The country provides the operator with a limitless spread of blue sky, a seemingly limitless expanse of rock and sand, and a definitely limited supply of water, obtained after the operator has drilled for it. Before the search for oil can be started, the problem of existence in the desert must be solved. The prospective wildcatter finds himself with none of the supporting facilities in a modern community. He lacks roads, shelter, and fuel; he carries the only food and water available. These factors have an important bearing not only on his first development steps, but also on his subsequent operations. From the beginning to the end of the undertaking, he is strictly on his own.

The desert, however, offers him one important compensation: open country and a resulting freedom of movement, provided he has learned how to travel in loose sand. Arabian American Oil Co. has solved the movement problem by the development of a special low-pressure sand tire. Using this tool in connection with the abundance of space that the desert offers, Aramco has devised methods of moving equipment in man-sized units. Probably nowhere else in world drilling operations is equipment moved on land in such large packages for such long distances.

Wildcat operations usually start with a group of interested people filling three or four automobiles and making an inspection trip to the prospective site. For example, there was the trip to locate 1 Haradh well during the summer of 1948. The Haradh area is about 125 miles southerly from the nearest American community at Abqaiq. The reconnaissance party consisted of three mem-





Left: A 136-ft. derrick and subbase being moved across the desert on sand tires. Below: Front dolly for moving drilling equipment as shown at left. Huge ball-and-socket joint permits steering

Wildcat camp at Haradh, Saudi Arabia. Numbered facilities are (1) water storage tanks on portable steel framework, (2) sand-tire equipped truck and canvas shelter in which minor repairs are made, (3) utility building, (4) five-room dormitory, (5) kitchen-mess hall-recreation unit, (6) another five-room dormitory

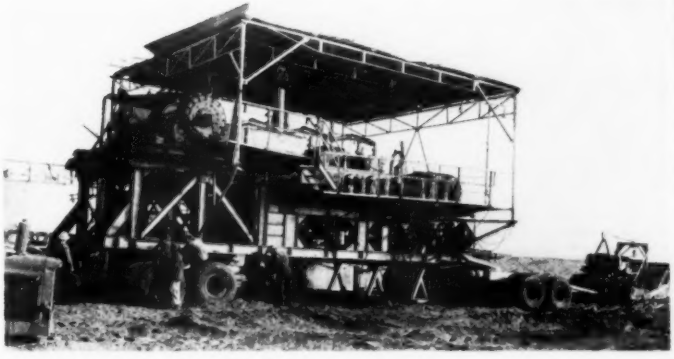
in Saudi Arabia

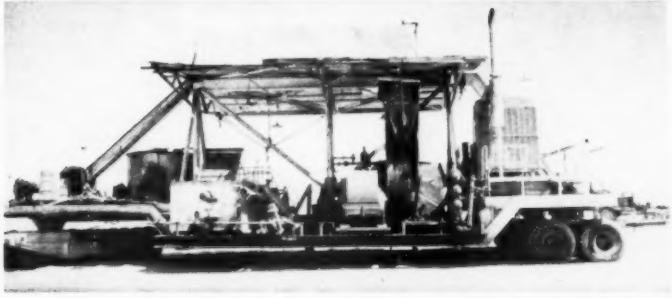
FEATURED BY PORTABLE EQUIPMENT— AND STRUGGLE TO EXIST IN THE DESERT

by Philip C. McConnell
Manager of production, Arabian American Oil Co.

bers of the geological organization, the drilling superintendent, a construction department representative who eventually would establish the wildcat camp, a transportation man who would have charge of grading the strip and improving 125 miles of desert trail, two petroleum engineers, and three miscellaneous individuals who went along for the ride. Five cars, including a pickup devoted to spare tires and gasoline, carried the party.

The caravan started early in the morning and progressed slowly for the first 4 hours as it made several tentative casts over vast strips of loose sand attempting to determine the best permanent route. The morn-





Above: Draw works-engine unit of the rig nearly ready for movement to the next location. Front dolly is being maneuvered into position

Left: Side view of the mud-pump unit en route to a new location. Skid includes a 50-bbl. crude-oil tank, a mud suction tank, the main mud pump, and radiator for diesel engine for auxiliary mud pump. A diesel-fuel tank is mounted on the roof. Front dolly has begun a turn

One of the rear dollies about to be attached to the rear of the derrick. Note the bracket

ing travel was pleasant, but by noon the temperature had reached 120° in the shade. After the loose-sand areas were passed, in the afternoon, the caravan picked up speed over the open sandy plains and reached its objective about 4 p.m., in spite of boiling radiators, flat tires, and the miscellaneous inconveniences of desert travel in the summer.

The geologists took a bearing from a nearby triangulation marker, and promptly made the well location. The remainder of the afternoon was spent chiefly in a search for a suitable location for an airstrip. The sites for water wells and the permanent camp were picked with little delay on an elevated terrace within easy walking distance of the well site. By 7 p.m. the sun had set and the temperature had dropped to a comfortable 100° or so. Water, food, and beds came out of the cars and the party relaxed for the night. The men slept in the open, ate a hurried breakfast before dawn, and headed back toward camp before their drinking water supply was exhausted. It disappears quickly in such temperatures.

Such is the pattern of the preliminary venture in Arabian wildcatting: a quick trip of inspection, and a stay of only a few hours to lay preliminary plans. A few weeks later, the next party moves into the location prepared to stay. This party carries tents, a portable kitchen, and tank trucks filled with water. The tents are rigged at the site, the kitchen established in a central position, and the tank trucks spotted some place between the kitchen and the location for the first water well.

The grading of the desert road and the development of a water supply are the first basic steps in the operation. One hundred miles or more of hard-surfaced highway is not to be considered at this time, but tractors and drags can start preparing the dirt road that with constant maintenance can carry transportation during the wildcatting period. All the water to be used in drilling the first water well must be hauled by tank truck from the nearest source: an Arab well on a caravan route, a shallow valley still holding water from the last spring rain, or perhaps a small well drilled by the structure drill party that made the first reconnaissance of the area. The Haradh operation was favored by a small well about 7 miles distant left by the structure drill party. Usually, the first water well is drilled with either cable tools or a small portable rotary. The basic idea is to use as little water as possible and, therefore, minimize the hauling problem. It takes a lot of 3,000-gal. truck loads of water to drill holes 200 to 600 ft. deep, the required depth range in eastern Saudi Arabia.

Foreman's office at a wildcat camp with Charles A. Lilly, foreman, at right. Radio keeps this camp in touch with headquarters

Well Requirements

When the first water well is completed and has been equipped with a pump, the main operation usually can start. If the previous water source has not permitted the drilling of a large-diameter well, a second well will be required, for most oil wells drilled in Arabia lose circulation at some depth, and from there to the next casing point, are drilled with water pumped into the formation at rates between 15,000 and 18,000 bbl. per day. Such a supply must be developed before start of the wildcat is attempted.

The first water well also can supply the general needs of the camp that immediately starts to take shape. Tractors and drags, assisted by scrapers, get busy on the airstrip, for planes will be required throughout the operation. Men and the lighter materials can be brought to the location by air throughout the period of drilling activity. A C-4 can carry a crankshaft, or a set of rotary jars, saving valuable drilling hours in an emergency. The drilling crews want to spend their days off in the home community, not in pounding back and forth through the desert on rough dirt roads. Airplanes are a solution to these problems.

The development of a dependable water supply is also the signal for establishing the wildcat camp. This is a feature of Aramco operations that is a logical outgrowth of the general portable-housing program of the company. Much of Aramco's living and working is conducted in comfortable air-conditioned houses 32 ft. wide by 40 ft. long which are constructed on heavy steel or timber bases in such a manner as to permit the entire house as a unit to be quickly placed on a steel framework

(Continued on page 244)

Drilling Methods used to speed up operations and reduce costs in Socony-Vacuum's Chimire field in Venezuela

by R. J. Tribbey*

IN the face of increasing wages and material costs and a softening of crude prices, it has been necessary for Venezuelan operators, among others, to seek more economical drilling methods. Socony-Vacuum Oil Co. of Venezuela, with concessions in Eastern Venezuela, during the past year has made a study of this problem and through planning and improved techniques has achieved results which have materially reduced both rig time and drilling costs.

The reduction of rig time per hole drilled was attacked from four directions by:

1. Training supervision

*District petroleum engineer, Guico district, Socony-Vacuum Oil Co. of Venezuela

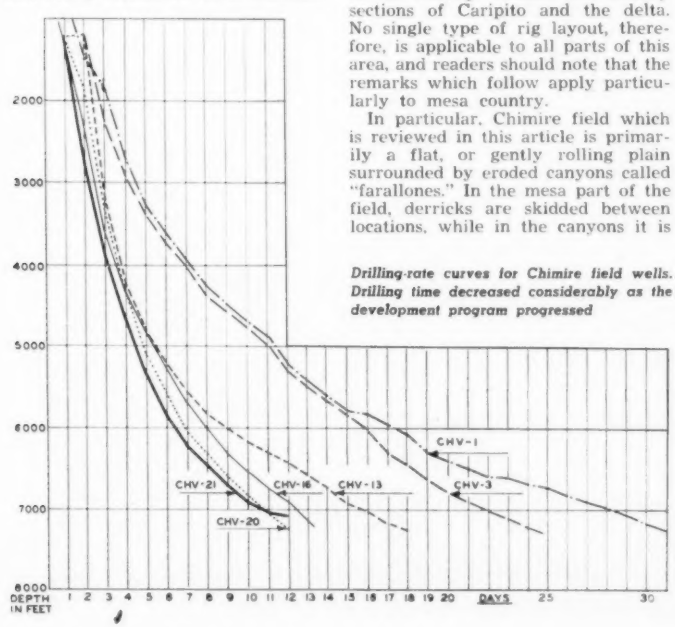
TABLE 1

Depth	01-4,500 ft	4,500-6,000 ft	6,000-7,000 ft	7,000-TD
Water Loss	Below 12.0 cc	Below 10.0 cc	Below 8.0 cc	Below 7.7 cc
Viscosity	35-40 seconds	40-45 seconds	40-45 seconds	45-50 seconds
Weight	Natural 10.2 lb./gal.	Natural 10.3 lb./gal.	Natural 10.4 lb./gal.	Natural 10.5 lb./gal.

2. Training of Venezuelan rig crews
3. Rig unitization
4. Selection of the most effective bits, rotary speed, number and size of drill collars, and mud-circulating rates for maximum drilling rate.

Eastern Venezuela encompasses an area of roughly 100,000 sq. km. Within this area all types of terrain are encountered from the smooth, flat plains or "mesa" of the El Tigre area to the heavily wooded and marshy sections of Caripito and the delta. No single type of rig layout, therefore, is applicable to all parts of this area, and readers should note that the remarks which follow apply particularly to mesa country.

In particular, Chimire field which is reviewed in this article is primarily a flat, or gently rolling plain surrounded by eroded canyons called "farallones." In the mesa part of the field, derricks are skidded between locations, while in the canyons it is usually necessary to erect a derrick for each well. The field was discovered by Socony-Vacuum but the pool extends to concessions owned by Mene Grande Oil Co. and to others jointly owned by Creole and Mene Grande.



Drilling-rate curves for Chimire field wells. Drilling time decreased considerably as the development program progressed

Drilling is carried out with medium-sized rigs capable of drilling to 8,000 to 10,000 ft. Both steam and power rigs are used, the former being in the majority. The formations drilled are sands and shales of Miocene age. Formation pressures cause very little difficulty, and, generally speaking, the holes stand up well. Caliper logs show, however, that the shales are relatively incompetent in normal water-base muds. Although Socony-Vacuum uses water-base mud for drilling and testing, another operator drilling in the same field has had some good results with oil-emulsion mud and, naturally, such experiments are followed with interest. The mud program followed by Socony is shown in Table 1.

Casing Program

The casing program calls for one joint of 13⅜-in. casing to be set as conductor pipe. Through this, 12¼-in. hole is drilled to 1,400 ft. There the intermediate 9⅝-in. 40-lb. J-55 casing is set and cemented with 350 sacks of construction cement. Through the 9⅝-in. string, 8⅝-in. hole is drilled to total depth varying from 7,300 ft to 8,600 ft. A 6-in. 18-lb. J-55 or N-80 (depending on final depth) production string is set through the productive sands and cemented with 600 sacks of oil-well cement.

Scratchers and centralizers have been used with some success. More recently, a type permitting rotation of the casing during cementation has

TABLE 2

Unit; Benefits sought:	Unitization plan
Boilers: Rapid change of boilers for repair work. Ease of rigging up and dismantling.	Make each boiler a separate unit. All connections on shell quick unions or flanges.
Boiler feedpump assembly: Reduce connection work while rigging up and reduce number of units to be moved or installed separately.	Use skids as heat exchangers so exhaust from feedpumps can heat feedwater. Mount generators and feedpumps on same skid so steam can be supplied from a common manifold.
Feedwater settling and storage tanks: Reduce time connecting up tanks.	Connect with rubber hoses.
Lines between boilers, feedpumps, storage tanks, and the rig floor: Reduce connections and dismantling time.	Prefabricate 4-in. steam line, 3-in. boiler feed pressure line and 4-in. water suction line in units of the same length equipped with unions. Fit hoist plate in the center of each unit for easy loading with boom truck.
Slush pumps and manifolds: Reduce rigging-up time.	Manifold so either pump can be compounded with the other, either pump can run on mud guns, or both pumps can run parallel on the hole. All quick union connections and standard lengths of piping equipped with valves.

TABLE 3

Unit; Benefits sought:	Unitization plan
Skid for transmission unit: The skid should allow better distribution of load.	Build skid to place under sand reel substructure so sand reel and transmission may be skidded as unit.
Mud pumps: Reduce rigging-up time. Make possible the moving and rigging up of one pump at next location before testing is completed on preceding well.	Make each independent pump a complete unit which need only be connected into the fuel and mud system.
Rig engines and compound: Reduce number of units to move. Reduce time used for spotting engines and connecting up lines while rigging up.	Mount on a skid so they can be moved as a unit. Use color code on all fuel, oil, and air lines to aid in rapid connection.

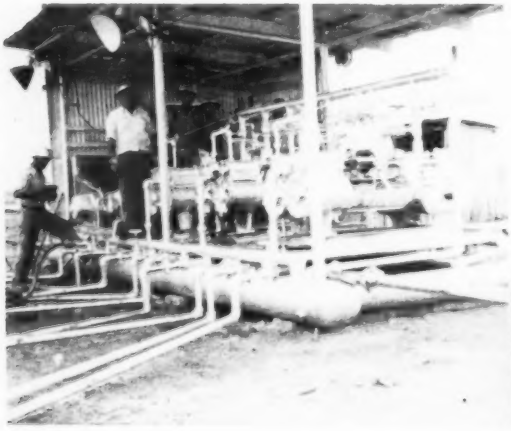
Drilling crew of a typical rig, composed of Venezuelans. Economy in drilling has been materially improved by training these men in safety and modern drilling techniques

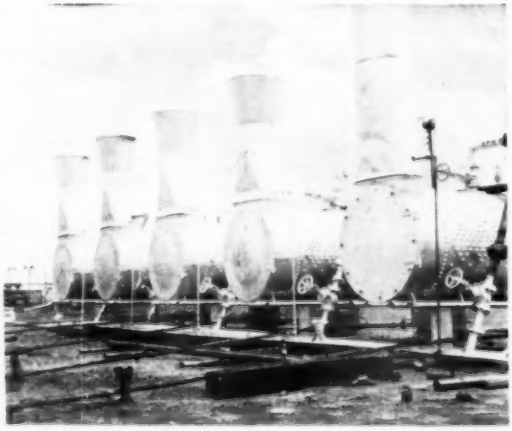
been used. An electric log is run before setting casing and gamma ray and collar logs are made afterwards. Sidewall sampling is normal practice by means of explosive propelled equipment, by punch-type barrels, or rotating coring tools. Sands to be tested are selected from the electric log and sidewall samples. Through use of the collar-locating device run above the perforating gun, the interval to be perforated is accurately positioned with respect to the gun. Multiple-sand completions are the rule where more than one sand is proved productive. Most wells are dual-zone completions, but two wells in the field have 7-in. casing set as production string instead of 6-in., and are completed as triple-zone producers. The dual completion equipment consists simply of a hooker-wall type packer run on 2½-in. EU tubing.

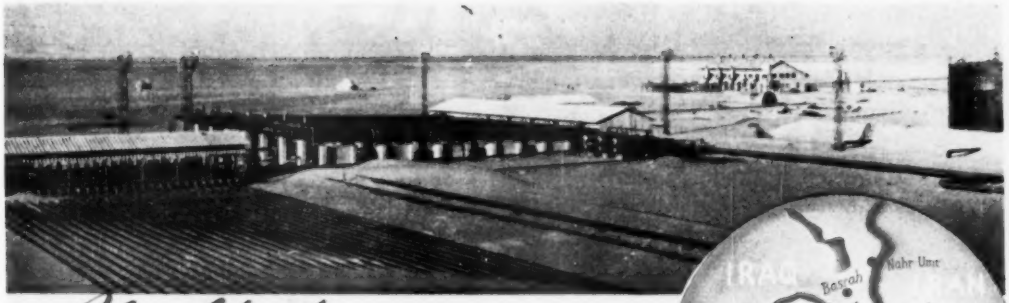
The question of supervision was closely studied and decisions were made to increase the amount of supervision. Now three expatriate supervisors (one for each 8-hour tour) are in charge of a maximum of two wells. These three men report to a head tool pusher, who in turn reports to the drilling foreman. It was not considered enough just to increase the numbers of supervisors, and steps were taken to see that the quality of the supervision was also improved. This was done by more active guidance from the drilling superintendent, by training supervisors in Venezuela and in the United States, by insistence on greater knowledge of the Spanish language.

(Continued on page 255)

Left: Unitized boiler feed-water pump hookup. Skid mounting doubles as a feed-water preheater. Right: Steam boiler at a drilling rig. Much of the drilling machinery in Chimire field is steam powered







Multistage Separation . . . . of Gas and Oil in Kuwait

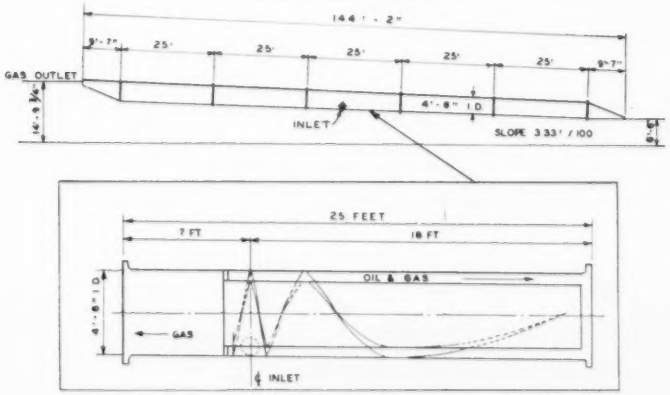
by E. W. McAllister*

BURGHAN field in Kuwait is divided into a number of producing areas of approximately 16 sq. miles each with 16 to 20 wells in each area, the present well-spacing program being one well for each 600 acres. In the center of each producing area there will be a gathering center of sufficient capacity to handle approximately 100,000 bbl. of oil a day and its associated gas.

The gas and oil separators used in the gathering centers are shells of 4-ft. 6-in. diameter and are in flanged sections 25 ft. long with eccentric conical ends, their total over-all length being approximately 144 ft. for each separator. The 25-ft. inlet section located in the center part of the separator is constructed with an inner shell as shown in Fig. 1. In the annulus between the inner shell and the outer shell is a helical vane which spirals the oil around the inside of the shell and at the same time directs the flow toward the oil outlet end of the separator. Other than the inlet spiral the separator is devoid of any baffles or scrubbing elements except vortex plates at the oil outlet. In this respect time and velocity factors are relied upon entirely for the complete separation of the oil and gas. However, any advantage to be gained by the use of scrubbing elements or mist extractors on any separator would also be applicable to this type separator.

*Kuwait Oil Co.

Top of page—General view of manifolding and separation installations. Incoming well manifold at left, separators at center, and the transit pump station right of center. Fig. 1—(Below) Diagram of the construction of the separators. Detail of the inlet section is shown in the bottom drawing



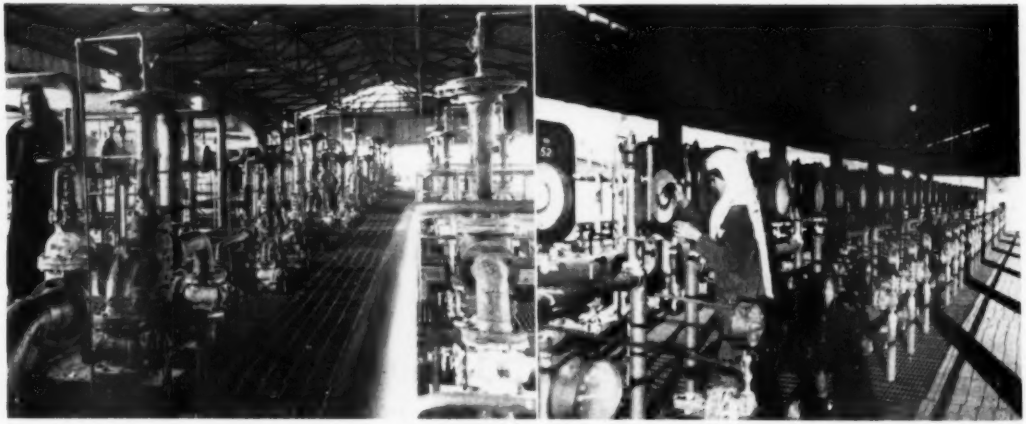
The separators are identical to those used in the more recently constructed separator settings or oil-stabilizing plants of Anglo-Iranian Oil Co., Ltd., in the Persian fields. The separators are installed on a slope of one diameter or slightly more in the full length. The tilted-type separator was given preference over a perfectly horizontal separator installation by Anglo-Iranian Oil, which was using both types of installations. The common vertical type separator was conceded generally not to be as efficient as a horizontal or nearly horizontal separator for handling the large volumes of oil and gas concerned.

Factors in Installation

The factors governing the installing of the separators slightly tilted, which generally causes some comment are as follows:

1. The normal vertical separator has the advantage of the full diameter of the shell for the passage of gas in the upper end and the storage of oil in the lower end. Offsetting this is the counterflow of falling liquid particles against the rising gas flow and, similarly, the counter flow or rising entrained gas bubbles against the downward flow of liquid. Also the liquid surface for dispersion of foam is limited to the diameter of the shell.

2. In a perfectly horizontal separator, the direction of flow of the gas and liquid is at right angles and not counter to the falling liquid particles



Left: Flow line orifice meters for measuring well production. Right: Oil and gas controls at the separator manifold

from the gas or rising gas bubbles in the liquid. A large liquid surface is also available for the dispersion of foam. Offsetting these factors, however, the area of the shell for the passage of gas is reduced by that portion of the cross-sectional area of the shell occupied by liquid or foam thereby increasing the velocity of the gas through the separator over that in a vertical separator of comparable diameter.

3. In a slightly tilted separator, which is usually longer than a perfectly horizontal vessel since the inlet is at the center and the oil and gas outlets are at opposite ends, the upper end of the shell is left free for the full passage of gas. Also there is no direct counterflow between liquid particles dropping out of the gas and, likewise, there is no direct counterflow between the flow of liquid in the lower end of the vessel and the rising entrained gas bubbles.

In other words, the major advantage of both the vertical and horizontal separators are obtained in a slightly tilted vessel. Further, the oil and gas are completely dissociated from each other and the dropping of liquid particles from the gas in the upper end of the vessel is not in conflict with the release of gas bubbles from the liquid in the lower end of the vessel.

The next considerations in the design of the separator settings were the number of pressure stages of oil and gas separation and the operating pressure of the initial stage. The well-head flowing pressures were between 550 and 650 psi. and it was desired that the initial stage of separation be as near this pressure range as possible for maximum capacity of equipment and increased separation efficiency.

In 1946, when these considerations were being made, the eight wells then completed were equipped with 4-in.-diameter flow lines. Data derived from these installations indicated that a 6-in.-diameter flow line, 2½ miles long, could handle approximately

(Continued on page 264)

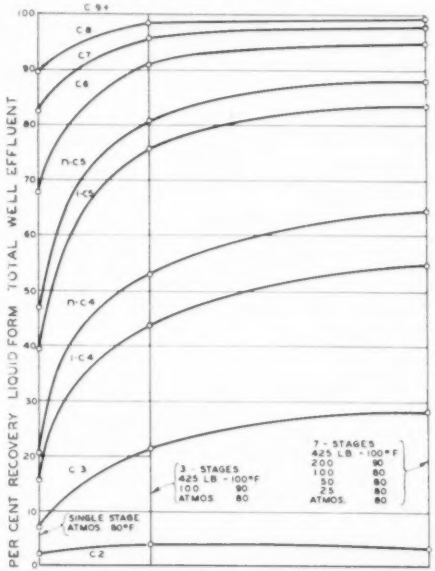
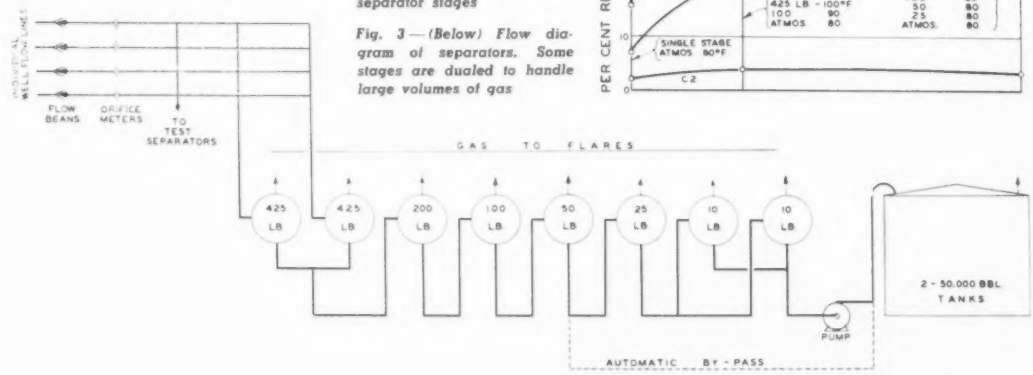


Fig. 2—(Right) Graphical representation of the per cent recovery of liquid from the produced fluid vs. number of separator stages

Fig. 3—(Below) Flow diagram of separators. Some stages are dualed to handle large volumes of gas



OIL-EMULSION MUD

. . . as used by Mene Grande in Western Venezuela has proved to be an economical and beneficial fluid

by A. O. Hamon*

OIL-EMULSION mud was first experimented with and used by Mene Grande Oil Co. in Western Venezuela in 1947 in the Lake Maracaibo basin and has proved to be a very economical and beneficial drilling fluid. It was first used by Shell Caribbean Petroleum Corp. in 1943 in its Mene Grande area, or the area of the "big seep," the site of the first successful oil producers in Venezuela. The mud was used there to successfully drill the Pauji shale, a formation practically impossible to drill with conventional clay-base mud due to the shale's excessive heaving tendencies.

Oil-emulsion mud was by no means a new mud process. The idea of "spotting oil" to free stuck drill pipe had long been a common practice. The principle of the mud is that just as small water globules may remain in suspension in a water-in-oil emulsion, in like manner the oil may remain in water in an oil-in-water emulsion, the water by definition being the continuous phase. By like reasoning, the natural clay-base mud becomes this continuous phase. With the addition of a third component, the emulsifying agent, minute particles of which are retained between the two phases, the oil emulsion mud results from thorough mixing of the clay-base mud, the oil, and the emulsifying agent. Engineers of the company developed an economical and easily prepared solution to use as this emulsifying agent. It consists of 1⅔ lb. of flaked caustic soda and 1⅔ lb. of tannic acid (quebracho) per gallon of water and is termed SS-1. It was found that this mixture was readily soluble in the conventional clay-base mud, but less so in oil; therefore, it was a good agent to form an oil-in-water emulsion of clay-base mud and oil. The solution is used consistently in mud operations today. Ordinarily 15-25 per cent oil, preferably low gravity, is added to conventional clay-base mud systems with pre-and-simultaneous addition of the emulsifying agent.

*Petroleum Engineer, Mene Grande Oil Co., C. A., Venezuela.

Dr. Tailleur, chief mud engineer for Mene Grande, and part of the Eastern Venezuela mud laboratory

Mixing and Handling Mud

Due to the lack of rig space in lake operations and the undesirability of erecting additional piers and mud tanks in view of the comparatively short time on a location, it has long been a practice to handle mud supply from barges mounted with 500 or 1,000-bbl. tanks. Two kilometers south of the M.G.O. Lagunillas terminal on the lake front is located a mud plant from which Mene Grande and Creole Petroleum Corp. receive their necessary clay-base mud requirements. The plant is operated by Creole. The "raw" clay-base mud is prepared from local clays and water. Resulting properties are: weight 85 lb. per cubic foot, water loss 25 to 30 cc. (30 minute, 100-lb. low-pressure test), viscosity 25 to 30 seconds (1,500 cc. in Marsh funnel, 500 cc. out). The pH is approximately 7½.

Wells are spudded in with the "raw" mud as a circulating medium. If treatment is necessary for viscosity and water-loss control, it is accomplished by conventional treatments. Not too much effort is required in treating this mud because of the ease and rapidity of drilling the higher sections.

The final casing string, usually 8⅝-

Left: Mixing oil-emulsion mud on a drilling barge in Venezuela's Bachaquero field. Right: Chemical mixing plant at the Lagunillas terminal, Lake Maracaibo

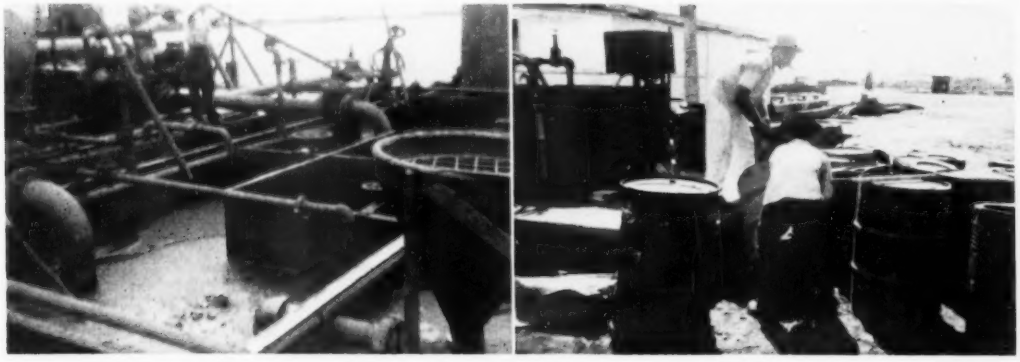


TABLE 1—WELLS USING CONVENTIONAL CLAY-BASE MUD TO DRILL PAY SECTION

Well—	Net footage drilled after cleaning out cement	Net hours of actual drilling	Average rate of penetration (ft. per hr.)
Lagunilla 9	480	62	7.74
Lagunilla 8	470	59	7.96
Lagunilla 2	452	66	6.85
Lagunilla 7	490	57	8.59
Lagunilla 5	493	85	5.80
Lagunilla 4	465	67	6.94
WELLS USING OIL-EMULSION MUD TO DRILL PAY SECTION			
Lagunilla 29	478	48	9.95
Lagunilla 32	550	66	8.33
Lagunilla 12	385	52	7.40
Lagunilla 14	350	39	8.97
Lagunilla 16	496	38	13.05
Lagunilla 13	455	28	16.25
Lagunilla 15	525	38	13.81
Lagunilla 30	485	55	8.81
Average rate of penetration in pay section with conventional clay-base mud			7.19
Average rate of penetration in pay section with oil-emulsion mud			10.23

TABLE 2—WELLS USING CONVENTIONAL CLAY-BASE MUD TO DRILL PAY SECTION

Well—	Hours under-reaming hole from $7\frac{3}{4}$ to $8\frac{5}{8}$-in.	Ease of running liner	Began flow during washing	Swabbed to production
Lagunilla 9	30	No indication of drag	Yes	No
Lagunilla 8	20	No indication of drag	No	Yes
Lagunilla 2	39	Stuck liner—7 days—fishing and re-reaming	No	Yes
Lagunilla 7	26	No indication of drag	No	Yes
Lagunilla 5	80	No indication of drag	Yes	No
Lagunilla 4	26	No indication of drag	No	Yes
WELLS USING OIL-EMULSION MUD TO DRILL PAY SECTION				
Lagunilla 29	11	No indication of drag	Yes	No
Lagunilla 32	39	No indication of drag	Yes	No
Lagunilla 12	24	No indication of drag	Yes	No
Lagunilla 14	11	No indication of drag	Yes	No
Lagunilla 16	18	No indication of drag	Yes	No
Lagunilla 13	10	No indication of drag	Yes	No
Lagunilla 15	18	No indication of drag	Yes	No
Lagunilla 30	14	No indication of drag	Yes	No

TABLE 3—WELLS USING CONVENTIONAL CLAY-BASE MUD TO DRILL PAY SECTION

Well—	Net open hole (ft.)	Date drilled cement shoe	Date well in production	Days	Remarks	Net days
Lagunilla 9	538	Dec. 18	Dec. 25	7		7
Lagunilla 8	530	Nov. 9	Nov. 27	18	Boiler repairs—3 days	15
Lagunilla 2	529	Apr. 18	May 5	17	Holiday—2 days	15
Lagunilla 7	499	Aug. 9	Aug. 23	14		14
Lagunilla 5	511	Jan. 12	Jan. 30	18	Boiler repairs—4 days	14
Lagunilla 4	510	Mar. 1	Mar. 12	11		11
WELLS USING OIL-EMULSION MUD TO DRILL PAY SECTION						
Lagunilla 29	559	Nov. 4	Nov. 11	7		7
Lagunilla 32	682	Nov. 7	Nov. 28	21	Boiler explosion—7 days lost	14
Lagunilla 12	450	Mar. 18	Mar. 27	9		9
Lagunilla 14	675	Aug. 16	Aug. 28	7		7
Lagunilla 16	599	Sept. 28	Oct. 6	8		8
Lagunilla 13	561	July 19	July 28	9		9
Lagunilla 15	569	Sept. 3	Sept. 9	6		6
Lagunilla 30	502	Dec. 9	Dec. 16	7		7

in. casing, is set when the producing sections are at first contacted. After cement is cleaned out, the cement-cut mud is treated ordinarily with bicarbonate of soda. However, it has been observed that even after treating this contaminated mud, it is often difficult to emulsify.

Much effort is spent in thoroughly treating this mud before emulsification begins. The mud engineer in charge, by predetermining the resultant weight and viscosity that is necessary after the mud is emulsified, supervises the addition of barytes and/or bentonite so that after the oil is added, necessary weight and viscosity will result. Simultaneously during the time the mud is being conditioned, SS-1 solution is being added to pretreat the mud and raise the pH.

After the engineer in charge determines mud properties, following conditioning and pretreating, the addition of oil begins. This oil is added from pump stations located among neighboring producers on the lake. Addition takes place slowly and usually requires 2 to 3 hours. It is preferable to add the oil over a period of two complete circulations, to obtain a balanced weight throughout the system. The oil is added into the mud suction boxes while mud guns are being operated to insure thorough mixing. Simultaneously, the SS-1 is added into the flow canal of the mud boxes.

In the case of workover operations, the same procedure of emulsification is followed. Wells scheduled for workover are killed with "raw" mud ordinarily and fishing operations are undertaken to recover as much of the old liner as possible. In tar-zone workovers, a cement plug is then set and a window is milled in casing near the shoe at a predetermined depth through which the new hole is sidetracked. For workovers of Eocene and other Miocene sands, the hole is sidetracked at a predetermined point below the casing shoe and above a cement plug. After the whipstock is set and preparations are complete to drill ahead, the mud is conditioned, pretreated, and emulsified as previously discussed.

Ordinarily the emulsion mud, after being prepared, requires no further treatment since it is only a matter of a few days' time until the 400 to 600 ft. of sand pay is drilled, the liner run, and the well completed. However, for each drilling tour there are mud-laboratory expeditors who make periodic checks on the mud at each rig and collect mud samples each 8-hour tour. The mud engineer in Lagunillas makes his laboratory tests. If the mud of a certain well calls for treatment, the mud engineer directs such treatment.

Wells Underreamed

When total depth is reached, the wells are underreamed from $7\frac{3}{4}$-in. diameter to $8\frac{5}{8}$ in. before the liner is run. After the liner is made up and run, the oil-emulsion mud is displaced by water or oil. For completions in Eocene sands, the wells are washed with oil. For the majority of Miocene completions the wells are washed with water.

In using the oil-emulsion it has been found possible to maintain weight and viscosity over any range necessary for mud control in Mene Grande's Lake Basin drilling operations. Muds have been carried with weights up to 105 lb. per cubic foot to date. Water loss, after emulsification, has averaged 3 to 5 cc. without excessive posttreatment. By posttreatment with phosphates, quebracho, caustic soda, and additional oil at intervals, water losses have been decreased to a figure of from 1 to 2 cc. (30-minute, low-pressure 100-lb. test). The pH values of the oil-emulsion have averaged 9 to 10.

The rate of penetration of the bit on wells drilled in the lake fields has been materially increased where oil-emulsion mud is used. In drilling in the lake fields it is customary

(Continued on page 322)

Here's an unusual discussion, describing in detail how

HAIFA REFINERY

Produces

80-Octane Straightrun Gasoline

by D. G. Pemberton*

THIS discussion deals with a method used in treating gasoline produced from Iraq crude in order to improve octane ratings. The disposal of byproducts is an interesting feature of the operation.

The Consolidated Refineries, Ltd.'s Haifa refinery† was originally designed to process 56,000 bbl. per day of stabilized Iraq crude from Kirkuk fields, using topping, wax cracking, viscosity reducing, and naphtha-reforming operations. The gasoline produced was to be of two grades, 67.5 and 70 octane, and the refinery was calculated to commence operations at the end of 1940. The emergency of the war, however, made it necessary to operate at the end of 1939 with the equipment then available or building, and due to the same emergency it soon became necessary to produce an 80-octane gasoline for certain types of military equipment in the western desert. It was not at that time convenient to operate the reforming units, and the production of 80-octane gasoline had to be planned on an entirely straightrun basis.

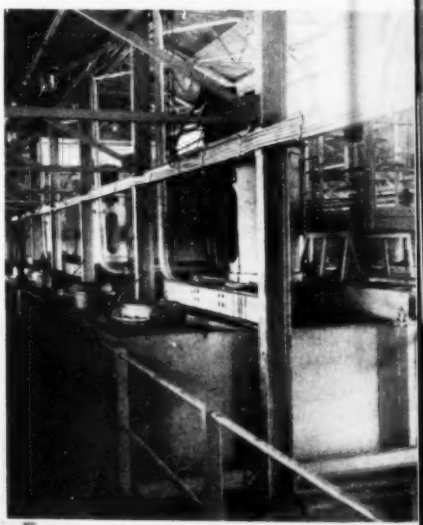
The distillation equipment available consisted of two 28,000-bbl. Kellogg units, designed for wax-cracking and viscosity-reduction operation. Since emphasis was from the start laid on maximum crude input, the wax-cracking sides of the units were revamped to form topping units of 8,000-bbl. input, and the viscosity-reduction furnaces were used in combination with the vacuum towers for asphalt production. A total crude input to the two units of 72,000 bbl. was thus possible, producing gasoline in two streams—"light cut" of e.p. 100° C. (212° F.) and "heavy

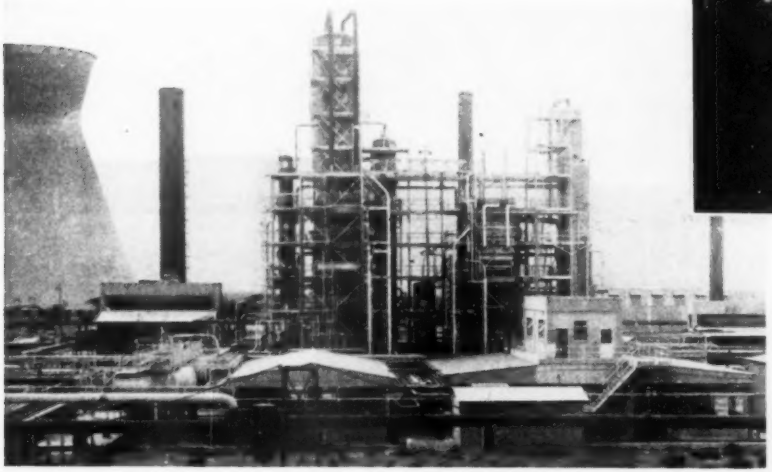
(Continued on page 257)

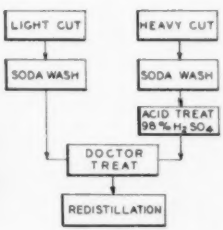
Right: Part of the equipment in the Holly-Mott acid-washing process at Haifa

Below: The combination unit in Consolidated Refineries, Ltd.'s, refinery

Lower right: Flow scheme of the treating process at Haifa

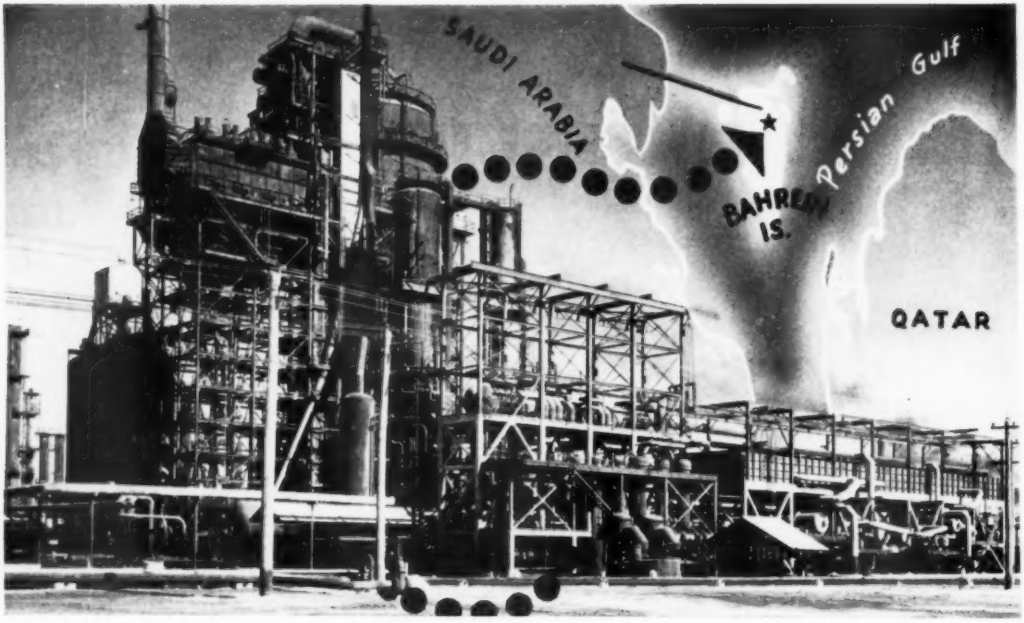






*Consolidated Refineries, Ltd.

†See The Oil and Gas Journal, November 17, 1945, for a description of principal operating features of Haifa refinery.



The two-stage catalytic cracking plant in the Bahrein refinery

Bahrein's 150,000-Bbl. Refinery

Produces gasoline, kerosine, diesel oils, fuel oils, and asphalt. New atmospheric unit scheduled for completion January 1951

THE 150,000-bbl. refinery operated by Bahrein Petroleum Co., Ltd., (Bahrein-Caltex) is located on the largest of a small group of islands comprising the Sheikdom of Bahrein 15 miles east of Saudi Arabia in the Persian Gulf. The plant produces gasolines, kerosine, diesel oils, fuel oils, and asphalt for shipment to markets in Europe, Africa, Australasia, and the Middle and Far East.

Development of Bahrein as an important oil-producing and refining center was started during 1930 and 1931. The first well was completed in June 1932 and by the end of 1934 a small topping unit had been constructed. The first cargo of Bahrein crude oil was shipped during this period. Since then expansion has been rapid and almost continuous.

The first large unit of the Bahrein refinery was put into operation during the summer of 1936, at which time it had a capacity of approximately 10,000 bbl. per day. By the end of the following year, the refinery was capable of processing 25,000 bbl. per day.

In 1939 a liquid phosphoric acid-quartz catalyst polymerization plant was constructed to convert olefinic gases from the reformer and cracking units into high-octane gasoline. Also during this year, a moderate and uniform withdrawal rate was established for Bahrein field in order

Employe dwellings, Awali Village, Bahrein Island. Besides maintaining homes for over 260 families, Bapco provides modern housing for its 1,034 single men and women employes

to maintain favorable reservoir conditions, and the first imports of Arabian crude to be processed at Bahrein were received from nearby Dammam field in Saudi Arabia.

A third crude unit having 25,000 bbl. per day nominal capacity was constructed when the United States entered World War II. Composed of an atmospheric section and a vacuum section, the unit was designed to produce a gas-oil feed stock to be used in a new fluid catalytic cracking unit for production of aviation fuel. Additional aviation-gasoline manufacturing facilities included HCl catalytic butane isomerization and sulfuric acid alkylation.

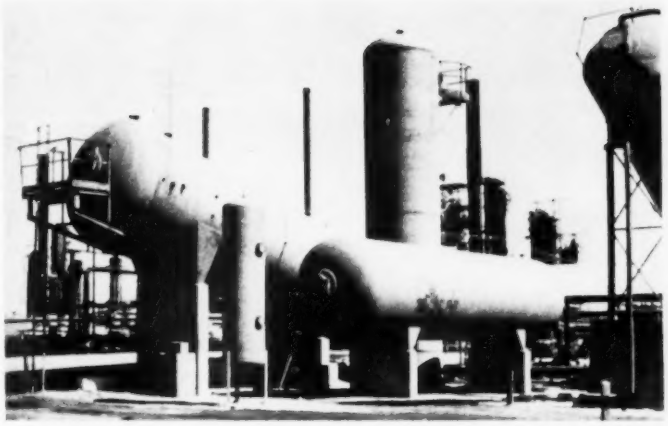
The two-stage U.O.P. fluid catalytic cracking unit shut down a short time after the end of the war is now back in partial operation as a single-stage cracking unit producing motor gasoline. Under the present scheme of operation, only the larger of the two reactors is in use. About 12,500 bbl. per day of virgin Arabian gas oil are being charged to the unit. A yield of about 35 per cent motor gasoline (8.5 lb. R.v.p.) is obtained, representing a 60 per cent conversion rate based on feed and resulting in about 40 per cent yield of catalytic gas oil. The motor gasoline thus produced has a clear octane of 79/80 by the C.F.R. motor method and 91/92 by the research method; upon addition of 1.5 cc. of TEL per gallon, motor and research ratings are 83 and 96, respectively.

For some time a portion of the catalytic cracking unit fractionating equipment has been used for crude-oil distillation on a temporary basis until new distillation equipment, now under construction, is completed. When this fractionating equipment again becomes available for cracked gasoline, the second reactor can be used in parallel operation with the first, and a total of 18,500 bbl. per operating day (15,000 bbl. per calendar day) of gas oil can be charged to the unit.

Two Reactors in Parallel

Use of two reactors in parallel will place an increased load on coke burning capacity in the catalyst regenerator. While previously operated at essentially atmospheric pressure, the regenerator operating pressure has been raised to about 5 psig. by means of a specially designed pressure-control mechanism, and a 10 to 15 per cent increase in coke-burning capacity results from the increased air-residence time and higher allowable air rate.

An asphalt plant placed in operation in 1947 produces a full line of paving and industrial asphalts from reduced crude. This plant has an annual capacity rating of 75,000 long tons of finished asphalt. Residuum charging stock for the asphalt converters is prepared in a vacuum distillation unit which was also completed in 1947.



Reaction vessel and inclined settler for lead sulfide gasoline-sweetening process at Bahrein

A conventional thermal reforming unit, charging 7,000 bbl. per operating day, was placed in operation during December 1948. This unit is virtually identical with two older units making a total reforming charge capacity of 21,000 bbl. daily. Heavy naphtha from Bahrein and Arabian crude is customarily charged to these reformers, the motor-method octane number being raised to 65-70 as required for blending into finished motor gasoline.

Gasoline produced in the new reformer and the catalytic cracking unit is sweetened by the lead sulfide process. Prior to sweetening, the catalytically cracked gasoline is acid treated and rerun to attain the storage stability characteristics desired in the hot Persian Gulf area.

Gases, C_3 and lighter, from the catalytic cracking unit are sent to the refinery fuel system. The C_4 fraction, however, is recovered and converted into high-octane motor-gasoline blending stock in a newly constructed polymerization plant. The process used at Bahrein was developed by California Research Corp. and has proved highly satisfactory since installation of the first unit in 1939. The newest plant consists of two large reaction chambers operated in series, preceded by two smaller ("guard") chambers operated in parallel. Butylene reaction rates are rap-

(Continued on page 262)

Sitra wharf showing loading facilities. Flush-type valve box in foreground was especially designed for this installation and is the first of its kind

Aerial view of the Amuay Bay installation of Creole Petroleum Corp.

Completion of Current Venezuelan Refinery Construction

will make nation rank fifth in world refining capacity. Four new plants will add 175,000 bbl. daily crude capacity

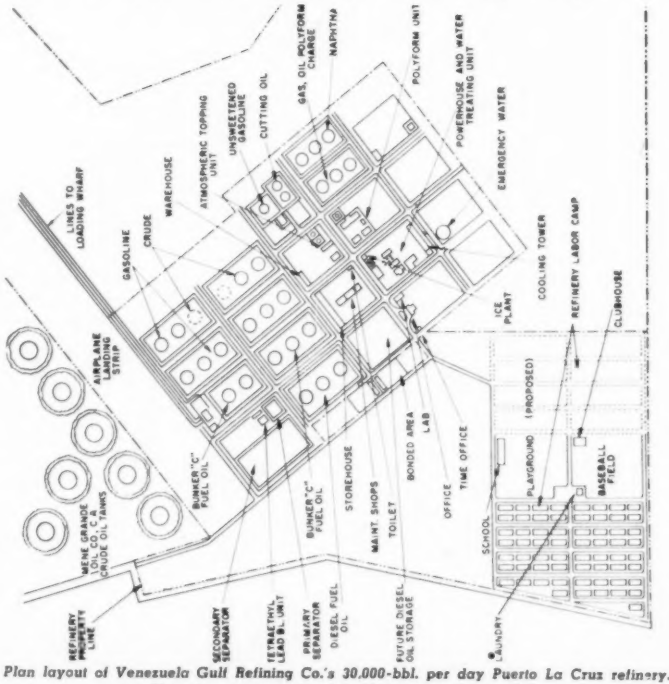
by George Weber
Refining Editor

MORE money for refining facilities is being invested today in Venezuela than in any other country in the world outside the United States. Four major refineries now in various stages of construction will cost an estimated $460,000,000 and will raise that country's crude processing capacity to 294,110 bbl. daily, an increase of nearly 150 per cent. On completion of current construction next year, Venezuela will rank fifth in world refining capacity.

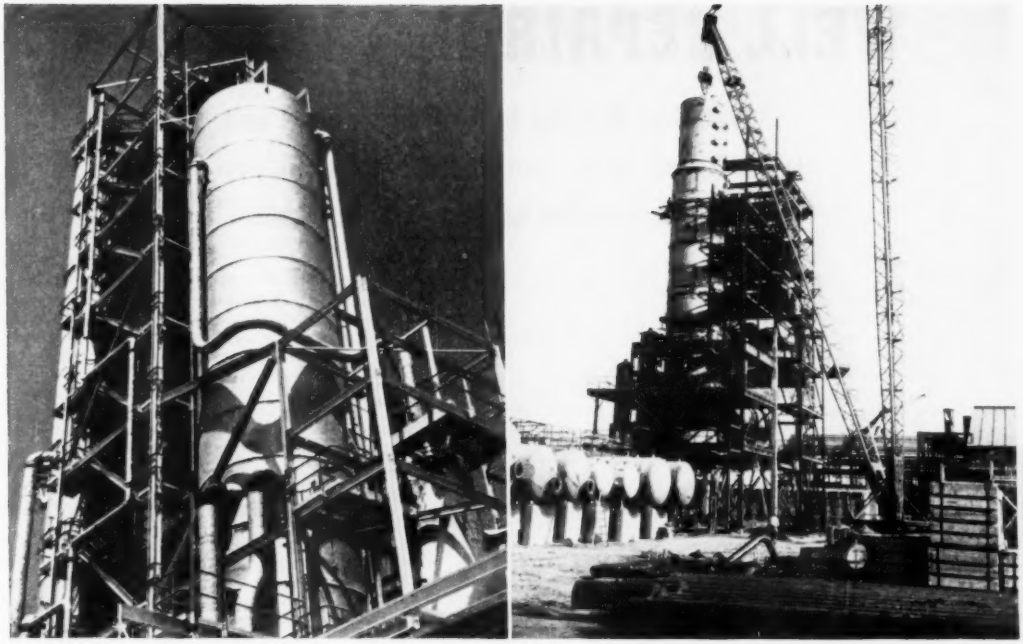
The four new refineries located along the northern coast of the country will add 175,000 bbl. daily to crude capacity. Modern distillation and cracking facilities will provide for substantial output of motor fuel, No. 2 burning oil, diesel fuel, and other distillate products, but heavy fuels will comprise nearly 50 per cent of crude charged.

Caribbean Refining Center

Including the immediate offshore islands of Aruba, Curacao, and Trinidad, whose refineries process Caribbean crudes, the geographic area along Venezuela's coast next year will embrace a refining industry which will exceed 1,000,000 bbl. in daily crude-charging capacity. Combined capacity on crude-oil input to the two refineries in Aruba and the plant in Curacao is currently set at 617,000 bbl. daily. This Caribbean refining center will be capable of charging more crude per day than all the refineries on the U. S. East Coast, and will rank second only to the Gulf



Plan layout of Venezuela Gulf Refining Co.'s 30,000-bbl. per day Puerto La Cruz refinery. This plant is scheduled for completion in mid-1950



Left: Fractionating column in the 30,000-bbl. daily crude-oil unit of Shell Oil Co. of Venezuela at Punta Cardon. Right: A stage in the erection of the crude-oil unit at Creole's Amuay Bay plant

Coast triangle bounded by Houston, Texas City, and Port Arthur.

Since predominant share of fuel production from the new Venezuelan refineries will move to world markets, the impact of this current construction program will become widespread by the end of 1950. Venezuela currently consumes about 40,000 bbl. of petroleum products daily. While local demand is rising at the phenomenal rate of roughly 25 per cent annually and gasoline consumption alone will be up about 38 per cent this year, Venezuela will still continue to absorb but a small fraction of domestically refined products. The substantial gain in product output will rank that country with Iran and the Netherlands West Indies as dominant net exporters of petroleum products.

Result of National Policy

Venezuelan refining activity may be expected to keep pace in the future with any trends in new production of crude in that country. Producing concessions in that country are now granted to companies with the agreement that certain percentages of resulting crude withdrawals will be refined in that country. The four major refineries now under construction are being built to meet such requirements. In addition to the five major companies participating in current projects, three others are known to have agreed to similar terms and will be required to erect refineries provided their production reaches certain totals in the future. Thus, with refining tied to producing capacity, Venezuela as a major producing country will in all probability hold its position as a ranking refining country for years to come.

Shell Cardon

The first of the new refineries to go on stream was the 50,000-bbl. per day Punta Cardon refinery constructed on the Paraguana Peninsula by Shell Co. of Venezuela, Ltd. The original 30,000-bbl. crude-distillation unit was completed and placed in operation last February. During the summer, reforming, treating, and vacuum distillation facilities were placed on stream and late this year, two U.O.P. 10,000-bbl. thermal cracking units charging crude are beginning initial operation. Other units added late this year provide for redistillation, gas recovery, catalytic polymerization, and acid and phosphate treating. The entire refinery is expected to be in full operation on or shortly after the first of the year. Contract for the processing units of this refinery was held by Lummus Co.

Plans announced earlier this year, for expansion of crude capacity and addition of facilities for new product output, are still in the doubtful stage. The company last summer announced that such further projects had been withdrawn for serious reconsideration, and no decision had been released by early December.

Creole—Amuay Bay

From the standpoint of crude-charging capacity, the Amuay Bay refinery of Creole Petroleum Corp. is the largest new plant in the current construction program and will be the largest in the country. This installation is located about 10 miles north of Shell's Punta Cardon refinery, on the arid Paraguana Peninsula about 100 miles northeast of Maracaibo.

Initial operation for the first unit, a 60,000-bbl. per day crude-distillation unit, is anticipated for January 1950. This atmospheric unit will pro-

(Continued on page 273)

TABLE 1—ESTIMATED YIELDS OF NEW VENEZUELAN REFINERIES
(Barrels per day)

Company, location—	Crude capacity	Gasoline	Kerosine	Diesel and No. 2 F.O.	Hvy. F.O. and asphalt
Creole, Amuay Bay	60,000	9,000	2,000	14,000	34,000
Shell Co. Venez., Punta Cardon	50,000	12,000	1,000	5,400	30,000
Venez. Gulf-Texas Pet., Puerto La Cruz	30,000	11,000		7,600	10,500
Venez. Pet. (Sinclair), Puerto La Cruz	35,000	6,000	1,000	10,000	17,000
Total	175,000	38,000	4,000	37,000	91,500

WELL REPAIR IN TARAKAN

Limited at first by lack of equipment and unskilled labor, work of reconstruction is now proceeding at a satisfactory rate

BEFORE the recapture of Tarakan (an island off the east coast of Borneo in the Celebes Sea) oil fields by Allied forces in 1945, the Japanese had destroyed nearly all existing wells. More than 303 wells had been torpedoed or junked. Drilling of new wells would have been the quickest method of regaining production in the fields, but shortages of tubular goods necessitated reconditioning of the torpedoed wells with the salvage of all casing possible.

Methods of destruction were thorough. Tubing and pump rods together were pulled for some tens of meters, after which they were dropped into the hole. Then the Japs destroyed the casing by exploding a torpedo above the tubing and finally threw a large amount of scrap in the hole. In one or two instances they first threw scrap into the hole and afterwards exploded the torpedo.

The damage caused to the casing was considerable, as can be seen from the accompanying photographs. Only in one instance was the casing split longitudinally by the explosion. On the other hand several cases are known in which two strings of pipe, cemented into each other, were radially shot off. There were also many cases in which the casing was entirely blown away over a length of 1 to 2 m. The maximum diameter of the casing destroyed by the explosion was in some instances 4 to 6 in. more than the original diameter. In a large number of cases the string was found to be torn up or damaged at a distance of 8 to 10 m. above or below the point of destruction. This may be connected with the position of the fluid level at the moment of explosion.

Repair Jobs Undertaken

At the commencement of the repair work the drilling staff encountered numerous difficulties. The only equipment available for repair work was a small prewar rotary unit, for which there were no spare parts, and a Japanese installation in rather bad shape. Fishing equipment was very limited, lacking such tools as releasing overshots and spears, hydraulic knuckles, or permanent magnets. Fires had annealed and rendered unfit for use tools stored in the warehouses. The bulk of the fishing tools had to be made locally in the repair shop.

Increased experience of native personnel, combined with standardization of fishing (wherever feasible), finally made it possible to have the repair work carried out by independent native drilling foremen working under the supervision of an experienced driller.

Fishing tools used.—The subsurface situation in the wells before commencement of reconditioning was about as follows: top of tubing was well below ground level; the water string was torpedoed at top of tubing, and above this was about 6 m. of scrap.

The removal of scrap and fragments of casing was a particularly lengthy process, especially during the initial period when it had to be done with the primitive equipment then available.

The clay basket first put to use was nothing more than a clay impression block. Pump piston rods weighing some 6 kg. were brought up in this way on several occasions. The great drawback of this apparatus, however, is that the clay, by coming into contact with water or mud slush, rapidly becomes soft and loses most of its adhesiveness. Since powerful permanent magnets have become available the clay basket is no longer used.

The first permanent magnets arrived in November 1946. They had a diameter of 5½ in. and were on this account suitable only for use in fairly large casings. Their high lifting power (up to 120 kg. aboveground) makes them a very valuable aid in fishing operations. Small scrap, such as bolts, nuts, jaws of chain tongs, wedges, and fragments of casing, fishing of which was formerly often difficult, can be removed in a very short time by their use. Mag-

Wells in Tarakan were both torpedoed and filled with junk by retreating Japanese forces. Top photograph shows a section of recovered blasted casing with an exploded torpedo in the foreground. Bottom cut shows some of the junk removed from the wells

nets are now available for use in 4-in. casings.

Fishing for tubing has been effected with the aid of normal fishing tools such as die collars, taps, and tubing spears. Lead impression blocks were tried but had the drawback of giving a very shallow impression, often difficult to interpret. Moreover, they have to be run on drill pipe, as it is necessary to load them with about 2 tons in order to obtain a fair impression. This manipulation often causes scrap once loosened to be wedged in again.

At present wax-impression blocks only are being used in Tarakan. Their hardness can be regulated at will by mixing with turpentine. The impression block, with a drill collar and a jar on top, is run on the swab line and gives an impression about 3 cm. deep.

Repair of casing strings was at first done by cutting the damaged pipes and then completing the string with the aid of a die collar. Before the damaged casing could be cut, it was necessary to mill the casing to measure internally, which proved a very lengthy operation. It was soon found that no reliable shutoff could be achieved in this way as the iron shavings produced by screwing caused premature jamming of the die collar. Present practice is to mill the casing externally to measure, unscrew the damaged section with a left-hand die collar, and complete the string.

With casing bowls which have recently been received, a bowl is placed over the cut casing, effecting shutoff by means of lead packing rings. The results are very good. The only drawback of this apparatus is the high price: a 6⅝-in. casing bowl costs over 400 florins. Work is in most cases being continued by the old method.

Reconditioning Procedure

If there are no definite indications that a well has been torpedoed, the first efforts made are to clear the hole with the fishing tools mentioned above. The small diameter of most of the casing is, however, a great obstacle to this work. If results are poor, washing over is started. Experience has shown that even in the few cases where wells were not torpedoed washing over and unscrewing lead to a successful recompletion more quickly than fishing.

Since drilling hard cement is an extremely slow process and since much quicker progress is made by drilling the formation outside the cement column; the diameter of the washover string is chosen at least equal to the diameter of the bit with which the hole was originally drilled.

Prior to washover, the top of the torpedoed water string is closed with a plug. This prevents a great deal of the mud from being circulated via the damaged casing, thereby reducing the velocity in the annular space between water string and washover string to such an extent that the risk of freezing arises.

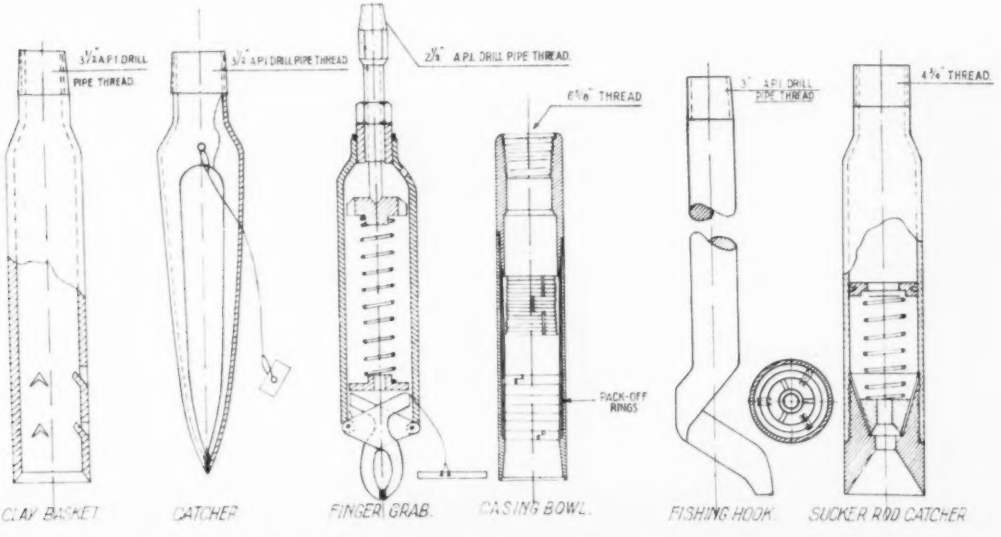
Only Japanese rotary tables are used for washing over, as the equipment is badly affected by abnormal stress and it is desirable to use this nonstandard type as long as they are available. On these rotary tables guide rods are fastened in two diametrically opposite cylindrical holes. A clamp, fixed around the washover string by means of bolts, can move freely up and down along these guide rods. When an interval corresponding with the length of the guide rods has been drilled, the clamp is again fixed in its highest position.

The best results in washover jobs have been obtained with extreme-line casing, the joints being screwed face to face, eliminating stress on the threads when washing over. Moreover, the coarse buttress thread suffers much less from the repeated screwing and unscrewing than the much finer A.P.I. thread. Another advantage is the special type of seal, which prevents the thread from being dirtied by the mud fluid. Last but not least, the streamlined casing profile greatly diminishes the risk of freezing.

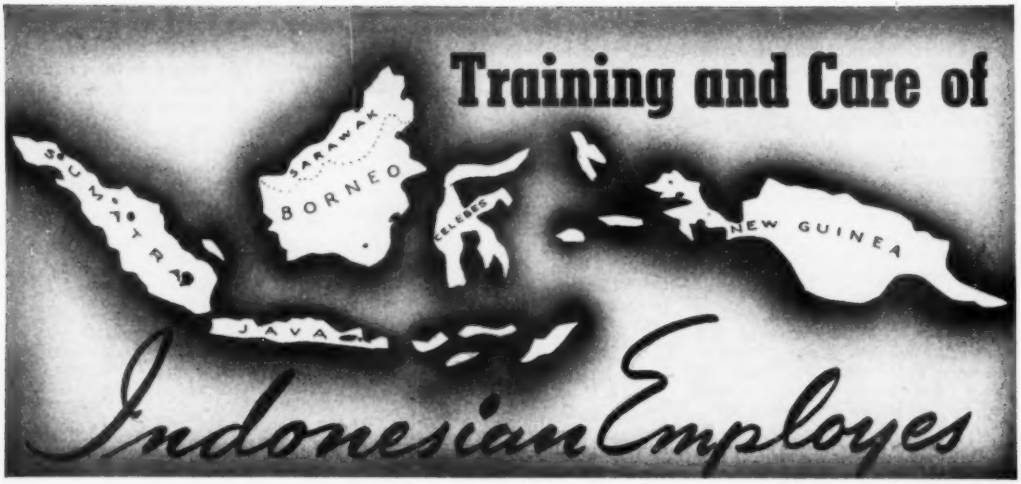
The speed or rotation is 40 to 45 r.p.m. in loose sands and 30 to 35 r.p.m. when washing over cement. Experience has shown that when drilling out cement at great rotation speed the core is rather smoothly turned off at the inner diameter of the washover shoe. This causes a gradually increasing friction and makes rotation more and more difficult. When washing over at slow rotational speed the cement crumbles and is further pulverized by the shoe. This crumbling is accelerated by reciprocating the drill stem over an interval of 20 to 30 cm. while rotating.

When washing over has advanced to the point at which the casing was torpedoed, the top part of this string nearly always sags away over a distance of about 2 m. The shreds of the two ends which then lie side

(Continued on page 276)



Tools being used in the damaged wells to recover junk and parted tubing, casing, and sucker rods



Training and Care of Indonesian Employes

AID for underdeveloped countries—a subject much discussed since President Truman's "Point Four" pronouncement—is not new to American oil companies. For years they have been underwriting huge investments in human welfare and furnishing technological assistance in remote corners of the world where crude oil is found.

With the oil industry, such investments of both money and skill are plain, ordinary, good business practice and bring results in many ways.

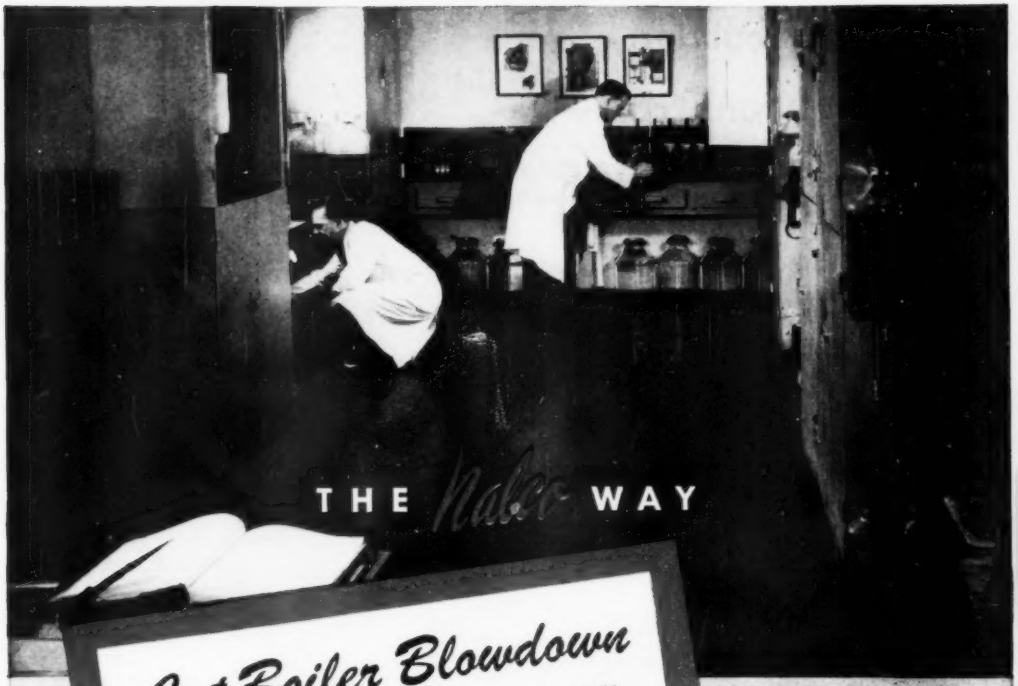
A case in point is what Standard-Vacuum Oil Co. has been doing in Indonesia through its producing and refining subsidiary, Standard - Vacuum Petroleum Maatschappij. There a community of 50,000 people in South Sumatra — chiefly Indonesian employes of SVPM and their families—are living a better life because of the company's efforts to provide improved housing, more food at lower prices, regular medical care, more sanitary living conditions, recreational facilities, and training opportunities designed to increase their individual earning capacity.

The example is of more than usual interest because Indonesia, about to achieve political independence from the Netherlands, is not only technically underdeveloped but also has been beset with grave postwar problems. These include the after-effects of the Japanese occupation, political upheaval and guerilla warfare, acute lack of food and clothing, shortages of all kinds of materials and supplies, wide - spread illiteracy, low health standards, and other equally disturbing factors.

Along with the rehabilitation of its war-damaged Sungei Gerong refinery near Palembang and the Talang Akar-Pendopo oil fields 80 miles upcountry and the stepping up of production and refining capacity to better than the prewar high, the company has embarked upon an extensive postwar program which is making similar progress in the improvement of living conditions generally. Since the company's policy is to employ local labor to the maximum extent possible—96 per cent of its employes are Indonesians or other Asiatics and only 4 per cent Hollanders or Americans—the over-all benefits

(Continued on page 278)

Above: Karun of the S.V.P.M. police department and his family, in home provided by the company at the Sungei Gerong refinery in South Sumatra. Left: A street in prewar S.V.P.M. residential section for Sungei Gerong workers and their families. Buildings and facilities have been rehabilitated for postwar occupancy, and initial construction is under way on a new housing development that will provide still more housing accommodations



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Above — The Nalco Way to water treatment results in unending research and development of continuously better methods and chemicals . . . Here, research goes forward in the Nalco Laboratories' Experimental Boiler Room (partial view).

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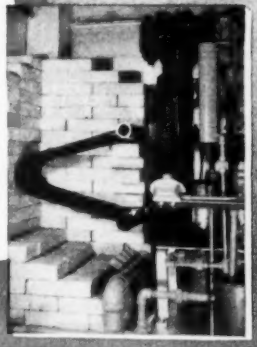
Details on the Nalco System for your plant — whether your boilers operate at 20 or 2000 p.s.i. — are available promptly on request. Nalco Bulletin 41 may also be of help to you: it is a thorough discussion on determination of steam quality, and the installation of sampling and recording devices. Write for Bulletin 41 today.

Below — One of the Nalco 1500 p.s.i., gas-fired miniature test boilers, used in antifoam research. Photo made before completion of furnace refractory and insulation.



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Moving a wall shell of the first hut into position at the construction camp for the Fawley refinery in England, being built by Anglo-Iranian Oil Co. The plant will have a crude-processing capacity of 110,000 bbl. daily

Construction of Europe's Largest Refinery *now under way*

by George Weber
Refining Editor

AT Fawley in South England, Anglo-American Oil Co., Ltd., has begun the construction of Europe's largest oil refinery. A complete modern plant with crude-processing capacity approximating 110,000 bbl. daily will be erected adjacent to the company's existing refinery located in the vicinity of Southampton. Representing one of the world's largest refinery construction projects currently under way, the plant will cost an estimated $150,000,000. Of particular interest is the fact that this huge project is a private capital venture and does not involve any ECA finance.

On completion of the present construction phase about 2 years hence, Fawley will constitute a major fuels plant producing motor gasoline and a complete line of quality diesel and fuel oils. The maximum yield of distillate grades will be high. Sufficient flexibility in processing will allow the adaptation of operations to conform to fluctuating market demands in the future.

Principal Units

Over 100,000 bbl. of the daily charge to the new refinery will comprise Middle East crudes, primarily from Kuwait and Iran. These will be processed initially in two distillation units which are designed to handle nearly 102,000 bbl. daily. The atmospheric crude still will produce the conventional straightrun distillate cuts of gasoline, naphtha, kerosine, and gas oils, reducing crude to about a 25 per cent residual bottom fraction. The second crude unit, combining atmospheric and vacuum distillation, will produce similar overhead and side cuts, an additional vacuum gas-oil distillate, and residual bottoms representing about 20 per cent of crude charged.

Straightrun gasoline streams from these units will be treated and blended with cracked product for finished motor fuels. Heavy naphthas will be reformed thermally in the existing unit at the old plant. The remaining distillate fractions, excepting some gas oil, diesel, and kerosine marketed direct, will combine to form the bulk of feed stock for catalytic cracking.

In its principal features, the Anglo-American fluid catalytic cracking unit will be identical to the 41,000-bbl. per day unit recently completed by the affiliated Esso Standard Oil Co. at its Bayway refinery, Linden, N. J. The reactor, regenerator, primary fractionator, and other large integral vessels will be duplicates of those in Esso's cat cracker, now the world's largest. The ultimate design capacity of 41,000 bbl. daily is not required initially, however, and the installation of various auxiliary equipment will be deferred for later purchase, the unit operating efficiently at a total throughput less than ultimate capacity.

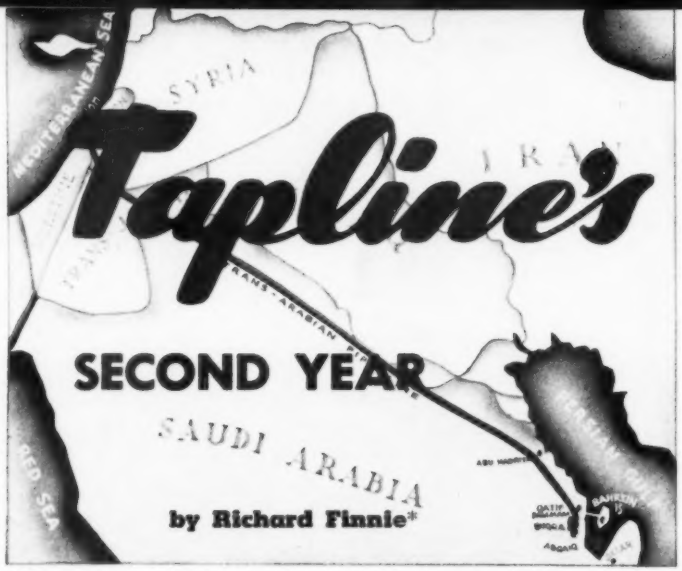
The F.C.C. unit will produce gasoline cuts for blending to two grades of high-octane motor fuel plus diesel fuel, light fuel blending stock, and bunker fuel. A conventional light-ends recovery unit will be incorporated as a part of the fluid plant.

In addition to the doctor sweetening employed in the present plant, treating facilities in the new refinery will include hypochlorite treating for solvent naphthas and kerosines, sulfur dioxide extraction for kerosines and high-quality diesel fuels, and copper chloride treating for straightrun and catalytically cracked naphthas and gasolines. Some distillation, cracking, and treating units of the existing plant will be modified to conform to the over-all operational program in the expanded refinery.

Auxiliaries

Steam for process and power requirements in the new refinery will

(Continued on page 282)



Tapline's SECOND YEAR

by Richard Finnie*

THE biggest oil pipe line in the world, traversing some of the most barren country to be found anywhere, moves toward its goal after overcoming unusual and unanticipated obstacles, some of the least of which have been physical.

When the vanguard of the field forces arrived in the Middle East in the early summer of 1947, after plans had been carefully laid, officials of Trans-Arabian Pipe Line Co. had no reason to doubt that the construction of their 30 and 31-in. crude-oil pipe line from the rich fields of the Hasa ward from the Persian Gulf and Williams Brothers Corp., of Tulsa, working eastward from Sidon. Due to the outbreak of hostilities in Palestine, however, the work of Tapline's western division was temporarily delayed. The eastern division was able to carry on. Supplies and equipment were landed, camps and access roads were built, and pipe laying went on apace.

Meanwhile the U. S. Department of Commerce postponed the export of pipe, and this caused a slowdown of work in the field for 3 months until shipments were resumed.

Coast of Saudi Arabia to Sidon, Lebanon, on the Mediterranean Sea would proceed with dispatch so as to begin delivering 300,000 bbl. a day to oil-hungry Western Europe by early 1950. But, through circumstances that could not be foreseen at the outset, the actual time of completion will probably be early in 1951.

Construction was to have been carried on from both ends, with International Bechtel, Inc., working west-

*Bechtel International Corp.

Above: Welding 31-in. pipe through rocky area along Tapline right-of-way. Followup welders are Arabs.

Right: Buckeye "48" ditcher en route across desert to start work on a buried section of the Trans-Arabian pipe line

All problems notwithstanding—and these included a change in the route of the pipe line so that it would tap an extra oil field—I.B.I. forces had managed, up until the end of 1949, to lay pipe over more than a third of the distance from the Persian Gulf to the Mediterranean, and to have made substantial progress on the construction of three pump stations.

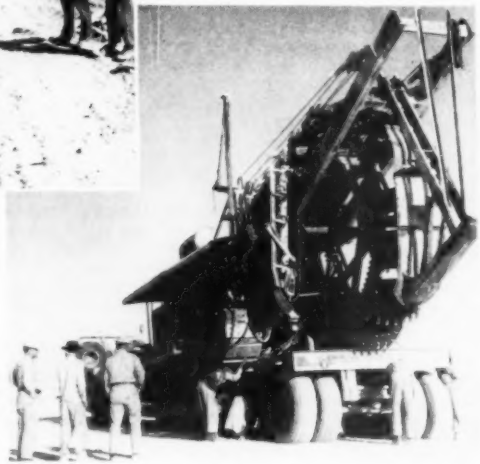
In recent months there has been a revival of activity at the Mediterranean end. By the end of October several shiploads of supplies, equipment, and pipe had been received at Beirut. The route survey in Syria was completed, and the survey through Lebanon was being carried forward. The rest of the survey, through Jordan and Saudi Arabia, was wound up early last year.

A construction camp is far advanced at the Sidon terminal site, where tank locations are being staked out. Steel has reached Beirut for three of the sixteen 180,000-bbl. tanks for the terminal, and for a 96,000-bbl. tank for the most westerly of the pump stations.

Feat of Logistics

Pioneering of Tapline's eastern division was a feat of logistics unsurpassed by an civilian organization in peacetime. It entailed the planning, requisitioning, and purchasing of some 7,000 separate kinds of items, not counting spare parts, which alone numbered 30,000, all to be started on their way to the job site 6 to 9 months ahead of anticipated requirements. The receiving port was Ras el Misha'ab, 12,000 nautical miles from the Pacific Coast, an uninhabited patch of desert on the edge of the Persian Gulf about 165 miles northwest of Arabian American Oil Co.'s main camp and administrative center, Dhahran.

Ras el Misha'ab was chosen because it offered the best available roadstead at a point from which com-



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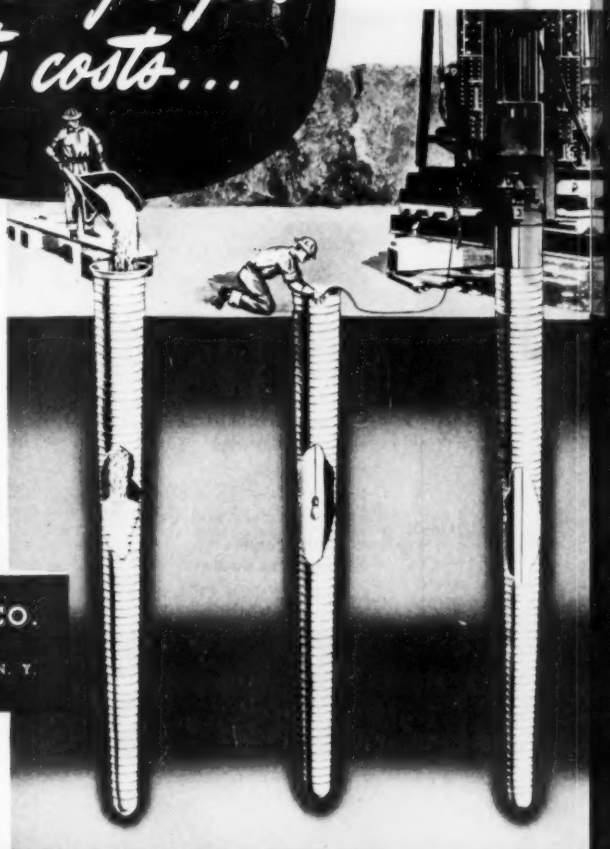

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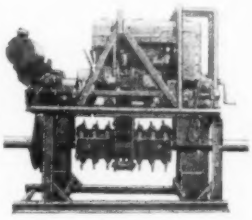

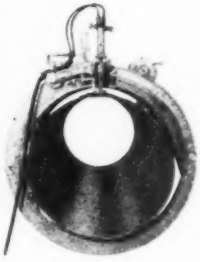

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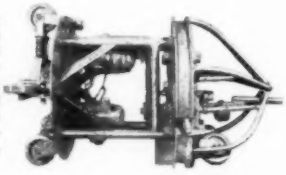

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paratively short access roads could fan out from the coast to meet the pipe-line route. The camp had its beginning with a handful of tents in July 1947. Only 6 months later it was a miniature town with warehouses, shops, offices, hospital, laundry, power plant, and fresh water and sewerage system. There were accommodations for 500 Americans and, in an adjacent tent city, some 1,500 Arabs. During the second year it took on an air of permanence, with various refinements added such as cottages for the families of top supervisory personnel.

The harbor facilities, construction on which was started almost before the first tent was erected at the site, comprised two large landings and a 3-mile-long overhead cableway.

This cableway installation, called the skyhook, originated in the Douglas fir forests of Oregon and Washington to haul logs out of inaccessible areas. It was to serve at Ras el Misha'ab to move, with a minimum of handling, pipe and miscellaneous freight, but chiefly pipe, from seagoing freighters to shore; for the water is too shallow all along this part of the Persian Gulf for large vessels to approach closer to shore than 2½ miles. The skyhook was completed and in operation by May 1948, but until then all freight was barged ashore. Anywhere from 500 to 800 tons a day came ashore on barges, with the skyhook, with three self-propelled machines rolling along its skylines, could deliver a thousand tons of pipe a day to shore from its man-made sea-island terminus, where the freighters discharged it.

165,000 Tons Unloaded

Between August 1947, when the first supply ship dropped anchor offshore, and October 1949, 165,000 tons of freight were brought ashore at Ras el Misha'ab. This figure includes 550 miles of 30 and 31-in. pipe fabricated at the Maywood, Calif., plant of Consolidated Western Steel Co. and shipped from Long Beach. Of the total main-line pipe requirements, 66 per cent have already been fabricated, and the remainder is to be delivered by the middle of 1950.

Shipped with the 30-in. joints within the 31-in. joints to conserve space and cost, the pipe is carried ashore on the skyhook in batches of six nested joints (three units), weighing up to 9 tons, to each of the three machines. Stockpiled until needed, it is then denested and welded together automatically in 93-ft. sections of three joints to expedite hauling to the right-of-way, to cut down field welding time, and to reduce the margin of human error. Four Bechtel-designed shield-arc machines with internal lineup clamps and water-cooled copper backup shoes, built by Westinghouse, are in operation at the pipe plant.

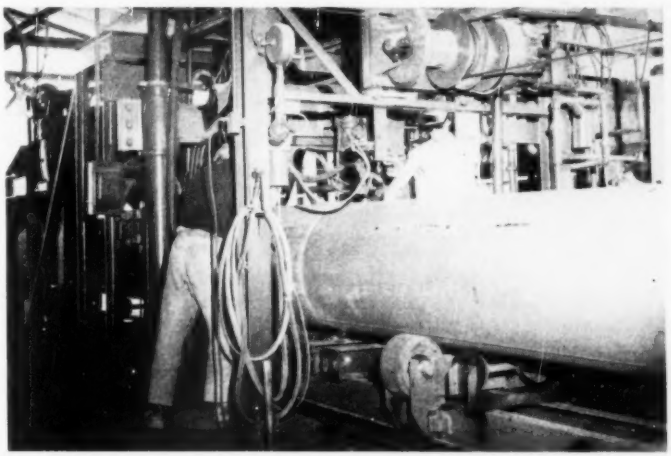
Starting as early as October 1947, a pioneer road was blazed as far as Duwaid, the halfway point on the pipe-line route, and line-camp construction was soon under way. Since then, to provide the pipe liners with food and shelter as they advanced, 10 mobile or temporary camps have been established on the desert. Sleeping quarters and service buildings of wood or aluminum are picked up bodily by cranes, placed on trailers, and shifted as needed.

In the spring of 1949 Tapline authorized I.B.I. to proceed with pump-station construction. Each station will become an oasis in the desert, costing in the neighborhood of $6,000,000, a self-contained community with a permanent population of a score of Americans and a hundred Arabs. Water wells have already been drilled at all of the main pumping-station sites.

The water wells, drilled in the desert where no surface water is to be found, are attracting large numbers of Bedouins who come with their livestock to troughs that have

(Continued on page 268)

Part of the pump-station foundations near Hafar Al Batin, showing the pouring of concrete for the setting of the first of a battery of five 1,710-hp. Worthington diesels



One of the four automatic shield-arc welding machines in use at Ras el Misha'ab. Three 31-ft. joints of 30 or 31-in. pipe are welded together in 93-ft. sections for hauling to the right-of-way. The machines were designed by Bechtel engineers and built by Westinghouse. Each makes about four complete welds per hour

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Bechtel engineers and construction men are justly proud of their part in effective development of the nation's industrial and natural resources which have created American living standards—highest in world history. To sustain and enhance these standards—while improving the lot of free peoples everywhere—is the vital task to which our energies are dedicated.

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DOLLAR OIL vs. STERLING OIL

Outlook for Production, Refining, Sales

NEARLY all foreign countries lack enough dollars to pay for dollar goods that they would like to buy. This world-wide dollar shortage is due to the fact that the United States does not buy enough from foreign countries to balance the amount that it sells in international trade. The only way that dollars can be made available to foreign countries is for the United States to purchase goods and services, to invest abroad, and to give dollars away. At present we are doing all three of these things and the world is still short of dollars. This situation has had a particular effect on the American oil companies operating internationally. The bulk of international oil trade is carried on by American-owned companies and by British and British-Dutch-owned companies and as a result most of the world's oil supplies has come to bear the label "dollar oil" and "sterling oil."

Broadly, dollar oil is oil entering international trade which is produced in any country (including the United States and Canada) by American or American-controlled companies. For example, oil produced in and exported from Venezuela and Saudi Arabia by American-owned companies is dollar oil just as much as if it were produced in the United States. One exception to this generality is that oil produced by American-owned companies within the sterling area which remains within that area can be classified sterling oil, but this is a minor factor in the over-all picture and therefore no effect has been given to it in the tables with respect to classification of dollar oil and sterling oil.

Broadly, sterling oil is oil entering international trade which is produced in any country other than the United States and Canada and is produced by companies owned or controlled by residents within the sterling area.

Oil is an essential commodity and if countries abroad do not have dollars to buy dollar oil but have and can use sterling to buy oil from British and British-Dutch companies, the dollar oil will be replaced by sterling oil. This is a very serious situation. If the problem is not solved, American oil companies may be forced out of many markets abroad in which they have carried on a substantial trade for many years.

What is the volume of dollar oil and sterling oil in international trade? What is the relative position of each? What is the outlook with respect to producing, refining, and sales? For a discussion of these questions authentic factual data presently available have been used. In this connection in October the Economic Cooperation Administration in Washington released a "Statistical Summary of Individual Plans of Oil Companies for the Development of World Oil Production, Refining, and Trade." Projected development plans between the years 1948 and 1953 were obtained from British, British-Dutch, and American companies from which a summary was prepared by the United Kingdom and Netherlands governments with the assistance of ECA.

Foreign Crude-Oil Production

For an indication of the volume of dollar oil and sterling oil in international trade, reference is made to foreign crude-oil production by Ameri-

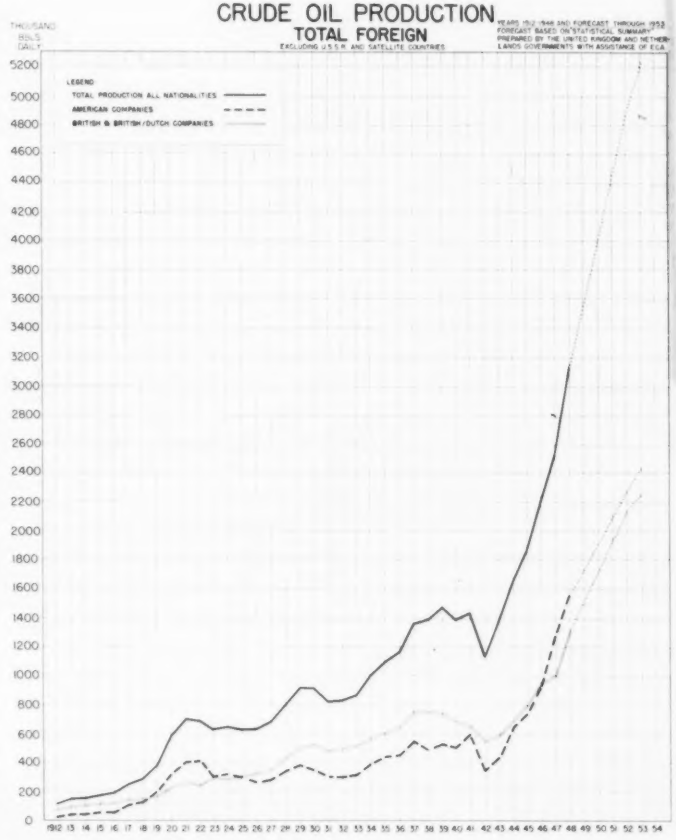

Fig. 1

TOTAL FOREIGN REFINING CAPACITY
Excluding U.S.S.R. and Satellite Countries

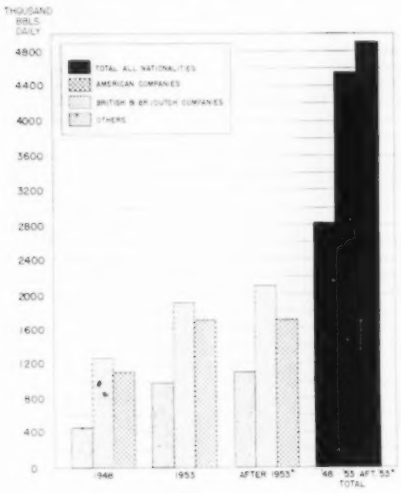

Fig. 2

*Includes capacity not included in 1953 due to (1) projects not wholly completed in 1953, and (2) projects not considered sufficiently firm to be included in 1953.

TOTAL FOREIGN REF.-PRODUCT SALES
Excluding U.S.S.R. and Satellite Countries

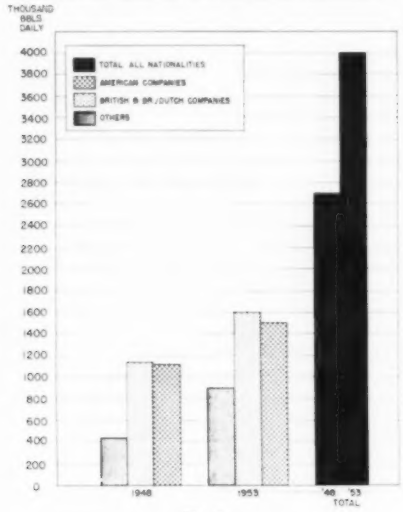

Fig. 3

can-owned companies and by British and British-Dutch-owned companies.

Table 1 shows that total foreign crude-oil production for 1938 was at the rate of 1,392,000 bbl. per day, of which American-owned oil companies produced 489,000 bbl. per day as compared with 765,000 bbl. per day for British and British-Dutch companies. This means that for every 100 bbl. produced abroad in 1938, only 35 bbl. was dollar oil as compared with 55 bbl. of sterling oil and 10 bbl. produced by other nationalities. However, Table 1 also shows that for the year 1948 American companies had reached a production level of 1,560,000 bbl. per day whereas British and British-Dutch companies produced only 1,316,000 bbl. per day of the total foreign production of 3,146,000 bbl. per day—i.e., for every 100 bbl. produced in 1948, 50 bbl. was dollar oil as compared with only 42 bbl. of sterling oil and 8 bbl. of other nationalities.

With respect to the outlook for foreign crude-oil production, the aforementioned summary indicates that by 1953 total foreign crude production will reach a level of about 5¼ million barrels per day of which American oil companies will produce about 2½ million and British and British-Dutch about 2¼ million, i.e., for every 100 bbl. produced in 1953, 47 bbl. will be dollar oil as compared with 43 bbl. of sterling oil and 10 bbl. of other nationalities.

It is to be noted from Table 1 that the production of dollar crude in 1948 was over 1 million barrels per day above the 1938 rate or an increase of over 200 per cent, whereas sterling crude production increased only about ½ million barrels per day or 72 per cent. Production plans over the next 5 years, however, indicate that sterling crude will be increased by 956,000 bbl. per day or 73 per cent versus 1948, as compared with an increase of 896,000 bbl. per day or only 57 per cent for dollar crude.

Fig. 1 shows historically the volume of dollar oil and sterling oil produced abroad and indicates the relative position of each from 1912 to 1948, and as projected through 1953 according to a summary of plans by American, British, and British-Dutch companies. Sterling oil exceeded dollar oil from 1912 through 1946 except for a few years in the early 20's during flush Mexican production. Beginning in 1947 and as projected through 1953 the production of dollar oil is expected to lead in volume but not to the extent of 1948.

Foreign Crude Production — Western Hemisphere vs. Eastern Hemisphere

Table 1 shows several important

TABLE 1—FOREIGN CRUDE-OIL PRODUCTION
(Excluding Eastern Europe)
(Thousands of barrels daily)

Hemispheres and nationality of companies	1938		1948		1953		Per cent increase			Relative position for each 100 bbl. produced		
	1,000 bbl. daily	% of total	1,000 bbl. daily	% of total	1,000 bbl. daily	% of total	'48 over '38	'53 over '48	'53 over '38	1938 Bbl.	1948 Bbl.	1953 Bbl.
Western Hemisphere (Excl. U.S.A.):												
American ($ oil)	403	82	1,038	67	1,230	50	158	19	205	47	56	54
British, British-Dutch (£ oil)	344	45	570	43	720	32	66	26	109	41	31	31
Others	100	72	232	86	340	67	132	47	240	12	13	15
Total	847	61	1,840	58	2,290	44	117	24	170	100	100	100
Eastern Hemisphere (Excl. Eastern Europe):												
American ($ oil)	86	18	522	33	1,226	50	(*)	135	(*)	16	40	42
British, British-Dutch (£ oil)	421	55	746	57	1,552	68	77	108	269	77	57	53
Others	38	28	38	14	164	33		332	332	7	3	5
Total	545	39	1,306	42	2,942	56	140	125	440	100	100	100
Total foreign (Excl. Eastern Europe):												
American ($ oil)	489	100	1,560	100	2,456	100	219	57	402	35	50	47
British, British-Dutch (£ oil)	765	100	1,316	100	2,272	100	72	73	197	55	42	43
Others	138	100	270	100	504	100	96	87	265	10	8	10
Total	1,392	100	3,146	100	5,232	100	126	66	276	100	100	100

*Over 500 per cent.

shifts in the relative position of crude produced abroad. In prewar 1938 the Western Hemisphere (excluding the U. S.) produced 61 per cent of the total foreign production—falling to 58 per cent in 1948 and to 44 per cent in 1953. Production increased in both hemispheres but the rate was faster in the Eastern Hemisphere. In 1938 only 18 per cent of all foreign dollar crude was produced in the Eastern Hemisphere — by 1953 dollar crude production will be about equally divided between the two hemispheres. Sterling crude production in the Western Hemisphere was 45 per cent of all sterling crude for 1938 and will decline to 32 per cent for 1953. Western Hemisphere dollar crude production will exceed Western Hemisphere sterling crude by 510,000 bbl. per day in 1953 whereas sterling crude will exceed dollar crude in the Eastern Hemisphere by only 326,000 bbl. per day.

Foreign Crude Produced in Western Hemisphere

Total foreign crude-oil production in the Western Hemisphere for 1938 was at the rate of 847,000 bbl. per day of which American-owned companies produced about 403,000 bbl. per day as compared with 344,000 bbl. per day for the British and British-Dutch companies. In other words, for every 100 bbl. produced, 47 bbl. was dollar oil as compared with 41 bbl. of sterling oil and 12 bbl. by other nationalities. Total foreign crude-oil production in the Western Hemisphere for the year 1948 amounted to 1,840,000 bbl. per day of which American companies produced 1,038,000 bbl. per day as compared with only 570,000 bbl. per day for the British and British-Dutch companies. This means that the relative volume of dollar oil produced rose from 47 bbl. in 1938 to 56 bbl. in 1948 whereas sterling oil fell from 41 bbl. to 31 bbl. and other nationalities advanced from 12 to 13 bbl. for each 100 bbl.

Total foreign crude-oil production in the Western Hemisphere is expected to reach 2,290,000 bbl. per day in 1953, of which American compa-

TABLE 2—FOREIGN REFINERY CAPACITY
(Excluding Eastern Europe)
(Thousands of barrels daily)

Areas and nationality of companies—	1948		1953		Increase		Relative position for each 100 bbl. of capacity		After 1953		
	1,000 bbl. daily	Per cent of total	1,000 bbl. daily	Per cent of total	1,000 bbl. daily	Per cent	1948 (bbl.)	1953 (bbl.)	1,000 bbl. daily	Per cent of total	Relative position for each 100 bbl. of capacity (bbl.)
Exporting areas:											
Caribbean:											
American	516	47	622	37	106	21	52	52	632	37	73
British, British-Dutch	474	38	540	29	66	14	48	46	540	26	45
Others	2	(†)	24	3	22	(*)		2	24	2	2
Total	992	35	1,186	26	194	20	100	100	1,196	25	100
Middle East:											
American	274	25	338	20	64	23	36	35	362	21	32
British, British-Dutch	490	39	612	32	122	25	64	64	752	36	66
Others	4	1	14	1	10	250		1	28	3	2
Total	768	27	964	21	196	26	100	100	1,142	23	100
Far East:											
American	40	3	64	4	24	60	31	25	64	4	25
British, British-Dutch	90	7	196	10	106	118	69	75	196	9	75
Others											
Total	130	5	260	6	130	100	100	100	260	5	100
Total exporting areas:											
American	830	75	1,024	61	194	23	44	42	1,058	62	41
British, British-Dutch	1,054	84	1,348	71	294	28	56	56	1,488	71	57
Others	6	1	38	4	32	(*)		2	52	5	2
Total	1,890	67	2,410	53	520	28	100	100	2,598	53	100
Importing areas:											
O.E.E.C. countries:											
American	92	9	394	24	302	328	24	31	394	23	29
British, British-Dutch	180	14	504	26	324	180	47	39	552	27	41
Others	112	24	382	39	270	241	29	30	406	36	30
Total	384	14	1,280	28	896	233	100	100	1,352	28	100
Other Eastern Hemisphere:											
American	2	(†)	16	1	14	(*)	6	13	16	1	13
British, British-Dutch	16	1	30	2	14	88	44	25	30	1	25
Others	18	4	74	7	56	311	50	62	74	7	62
Total	36	1	120	3	84	233	100	100	120	2	100
Other Western Hemisphere:											
American	177	16	241	14	64	36	35	32	241	14	29
British, British-Dutch	12	1	14	1	2	17	2	2	14	1	2
Others	326	71	489	50	163	50	63	66	579	52	69
Total	515	18	744	16	229	44	100	100	834	17	100
Total importing areas:											
American	271	25	651	39	380	140	29	30	651	38	28
British, British-Dutch	208	16	548	29	340	163	22	26	596	29	26
Others	456	99	945	96	489	107	49	44	1,059	95	46
Total	935	33	2,144	47	1,209	129	100	100	2,306	47	100
Grand total exporting and importing areas:											
American	1,101	100	1,675	100	574	52	39	37	1,709	100	35
British, British-Dutch	1,262	100	1,896	100	634	50	45	42	2,084	100	42
Others	462	100	983	100	521	113	16	21	1,111	100	23
Total	2,825	100	4,554	100	1,729	61	100	100	4,904	100	100

*Over 500 per cent. †Less than ½ of 1 per cent

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D-3	3200	6400	D-13	12750	80000
D-4	4100	10000	D-15	15000	114000
D-5	5200	16000	D-21	20700	160000
D-7	6500	25000	D-24	24150	228000
D-9	8900	40000	D-29	29000	320000
D-11	11000	57000	D-32	32400	456000

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DIVISION OFFICES: CASPER; FT. WORTH; PITTSBURGH; TULSA; TORRANCE.

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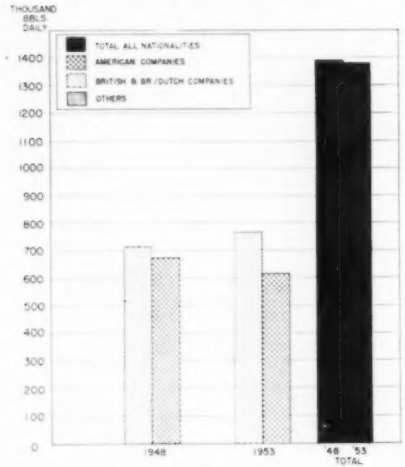
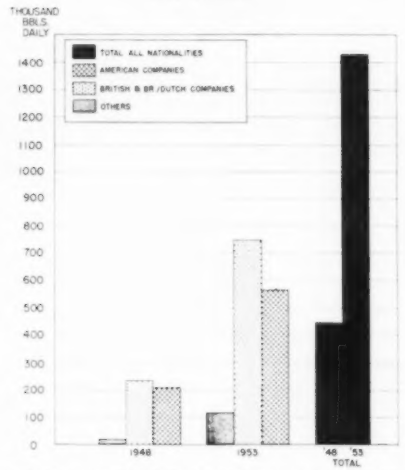
THE NATIONAL NSCO SUPPLY COMPANY — NATIONAL BLUE PRODUCTS

LINE OF OIL FIELD EQUIPMENT ★ FOR PRODUCTION

TOTAL MOVEMENT OF REFINED PRODUCTS TO IMPORTING AREAS FROM EXPORTING AREAS



TOTAL MOVEMENT OF CRUDE OIL TO IMPORTING AREAS FROM EXPORTING AREAS



Importing areas include Latin America (all countries south of Mexico excluding Caribbean export area, OEEC countries, Spain and Canary Islands, Asia (excluding Far East and Middle East areas), Africa, Oceania. Exporting areas include North America (excluding countries south of Mexico), Caribbean, Middle East, and Far East areas.

Fig. 4 *Fig. 5*

nies will produce 1,230,000 bbl. per day as compared with 720,000 bbl. per day for the British and British-Dutch companies. The relative position of dollar oil produced is expected to decline from 56 bbl. in 1948 to 54 bbl. in 1953, whereas sterling oil is expected to maintain in 1953 its 1948 relative position of 31 bbl. and other nationalities will rise from 13 bbl. to 15 bbl. for each 100 bbl. produced. This decline in position of dollar-oil production reflects probably the displacement in the Argentine market of dollar crude by sterling crude as per the Anglo-Argentine agreement.

Crude-Oil Production in Eastern Hemisphere

The growth in dollar-oil production in the Eastern Hemisphere has been phenomenal due largely to developments in Saudi Arabia and Kuwait. American-owned production rose from a low level of only 86,000 bbl. per day in 1938 to 522,000 bbl. per day in 1948 and according to plans submitted will reach 1,226,000 bbl. per day in 1953. This rapid growth has brought about considerable shift in the relative position of dollar oil from 16 bbl. in 1938 to 40 bbl. in 1948 and to 42 bbl. in 1953 for each 100 bbl. produced in the Eastern Hemisphere. Sterling-oil production has been stepped up along with dollar oil but the pace has been slower. Starting off in 1938 at a much higher level of 421,000 bbl. per day as compared with only 86,000 bbl. per day for dollar oil, sterling-oil production rose moderately over a 10-year period to reach 746,000 bbl. per day in 1948. However, a substantial jump in production has been planned over the next 5 years to reach a level of 1,552,000 bbl. per day in 1953. Notwithstanding this growth the relative position of sterling oil has fallen off from 77 bbl. in 1938 to 57 bbl. in 1948 and to 53 bbl. in 1953 for each 100 bbl. produced in the Eastern Hemisphere. Crude-oil production by other nationalities is not large volumetrically in the Eastern Hemisphere, representing production of only 7 bbl. for each 100 bbl. produced in 1938 and is expected to decline to 5 bbl. in 1953.

Table 2 shows the situation for 1948 and for 1953 as based largely on the summary prepared by the United Kingdom and the Netherlands

TABLE 3—REFINED PRODUCT SALES IN FOREIGN COUNTRIES
(Excluding Eastern Europe)
(Thousands of barrels daily)

Foreign areas and nationality of companies	1948		1953		Increase		Relative position for each 100 bbl. of sales	
	1,000 bbl. daily	Per cent of total	1,000 bbl. daily	Per cent of total	1,000 bbl. daily	Per cent	1948 (bbl.)	1953 (bbl.)
Western Hemisphere (excl. U. S. A.):								
American	479	43	554	37	75	16	50	44
British, British-Dutch	180	16	230	14	50	28	19	19
Others	304	71	466	51	162	53	31	37
Total	963	36	1,250	31	287	30	100	100
O.E.E.C. countries:								
American	310	27	438	30	128	41	34	30
British, British-Dutch	488	43	696	44	208	43	54	48
Others	104	24	308	34	204	196	12	22
Total	902	33	1,442	36	540	60	100	100
Other Western Europe:								
American	22	2	18	1	(4)	(18)	37	23
British, British-Dutch	30	2	34	2	4	13	50	42
Others	8	2	28	3	20	250	13	35
Total	60	2	80	2	20	33	100	100
Asia and Oceania:								
American	212	19	344	23	132	62	36	36
British, British-Dutch	364	32	548	34	184	51	62	58
Others	11	2	53	6	42	382	2	6
Total	587	22	945	24	358	61	100	100
Africa:								
American	100	9	132	9	32	32	55	47
British, British-Dutch	78	7	94	6	16	21	43	33
Others	3	1	55	6	52	(*)	2	20
Total	181	7	281	7	100	55	100	100
Total Eastern Hemisphere:								
American	644	57	932	63	288	45	37	34
British, British-Dutch	960	84	1,372	86	412	43	56	50
Others	126	29	444	49	318	252	7	16
Total	1,730	64	2,748	69	1,018	59	100	100
Grand total foreign:								
American	1,123	100	1,486	100	363	32	42	37
British, British-Dutch	1,140	100	1,602	100	462	41	42	40
Others	430	100	910	100	480	112	16	23
Total	2,693	100	3,998	100	1,305	48	100	100

*Over 500 per cent (Decrease

governments with the assistance of ECA. Situations similar to that caused by the Anglo-Argentine agreement have resulted in American-owned refineries running sterling crude or crude of other nationalities but the volume of this factor is not known and not given effect in the tables and charts. Table 2 points up a number of important facts among which are briefly the following:

Total intake capacity of all foreign refineries in 1948 was 2,825,000 bbl. per day and is to be expanded to reach a total in 1953 of 4,554,000 bbl. per day, an increase of 1,729,000 bbl. per day, or 61 per cent. The capacity for 1953 includes proposed refinery-construction plans that have been considered to be firm and also only new plants completed by 1953. Taking into consideration all known proposed projects including expansion of old plants a total of 4,904,000 bbl. per day has been arrived at, an increase of 2,079,000 bbl. per day, or 74 per cent over 1948.

It is important to observe that American, British, and British-Dutch companies are planning substantial expansion during the 5 years 1949-53 inclusive. Total foreign capacity of American-owned plants will be enlarged from 1,101,000 to 1,675,000 bbl. per day, an increase of 574,000 bbl. per day or 52 per cent. Including all known proposed new and expanded plants, the total capacity of American-owned refineries will reach 1,709,000 bbl. per day, an increase of 608,000 bbl. per day or 55 per cent. Projected refinery capacity of British and British-Dutch-owned companies indicates that their plant expansion will be made at about the same rate as for American companies, i.e., from 1,262,000 bbl. per day in 1948 to 1,896,000 bbl. per day in 1953, an increase of 634,000 bbl. per day or 50 per cent. Including all known British and British-Dutch projects the total capacity may reach 2,084,000 bbl. per day, an increase of 822,000 bbl. per day or 65 per cent.

It is of equal important to observe that other nationalities also plan to expand their refining facilities from a total of 462,000 bbl. per day in 1948 to 983,000 bbl. per day in 1953, an increase of 521,000 bbl. per day or 113 per cent. Including all known plans for expansion, refining capacity may rise to 1,111,000 bbl. per day, an increase of 649,000 bbl. per day or 140 per cent. Relating the expected refinery throughput of plants owned by other nationalities to the crude-oil production by other nationalities indicates that substantial quantities of crude will have to be supplied by American-owned companies or by British, British-Dutch-owned companies.

In view of the fact that both American, British, and British-Dutch companies are planning to increase their refining capacity at about the same rate, there will be no great change in the relative position of these two groups of companies for 1953 as compared with 1948. For every 100 bbl. of throughput in 1948, 39 bbl. was processed in American-owned plants and 45 bbl. in British and British-Dutch-owned plants. The position of American-owned companies will fall only slightly in 1953 or shortly thereafter to 35 bbl., and the British, British-Dutch-owned companies will fall to 42 bbl. The decline in the position of both American and British, British-Dutch companies may be attributed largely to the substantial rise in the capacity of plants owned by other nationalities, i.e., from 16-bbl. throughput in 1948 to 23 bbl. in 1953 or shortly thereafter.

Table 2 shows that the greater part of the expansion of foreign refinery capacity will take place in the importing areas, and for the most part in the OEEC countries where each of the three groups of companies will participate in refinery construction. In the OEEC countries the position of British and British-Dutch companies is substantially above American companies, i.e., 41 bbl. versus 29 bbl. and as compared with 30 bbl. for other nationalities for each 100 bbl. of refinery throughput, as projected to 1953 or shortly thereafter.

Refined-Product Sales in Foreign Countries (Exclusive Eastern Europe)

Sales volume of each of the three groups of companies is portrayed in Fig. 3 and also shown by selected geographical areas in Table 3.

Total foreign refined product sales of all companies in 1948 was 2,693,000 bbl. per day and as based largely upon the "statistical summary," sales are expected to reach 3,998,000 bbl. per day in 1953, an increase of 1,305,000 bbl. per day or 48 per cent. Projected sales over the 5 years seem overly optimistic indicating an arithmetical average yearly rate of increase of 9.6 per cent.

Sales of refined products by American-owned companies in 1948 amounted to 1,123,000 bbl. per day and sales are expected to reach 1,486,000 bbl. per day in 1953, an increase of 363,000 bbl. per day or 32 per cent. This increase appears reasonable as the arithmetical average yearly rate of increase would be 6.4 per cent.

Sales of refined products by British and British-Dutch-owned companies in 1948 was 1,140,000 bbl. per day and sales are expected to reach 1,602,000 bbl. per day in 1953, an increase of 462,000 bbl. per day or 41 per cent. This seems to be rather high as the arithmetical average yearly rate of increase would be 8.2 per cent.

Sales of refined products by other nationalities amounted to 430,000 bbl. per day in 1948 and are expected to reach 910,000 bbl. per day in 1953, an increase of 480,000 bbl. per day or 112 per cent. This very large increase means an arithmetical average yearly rate of increase of 22.4 per cent—an abnormally high percentage increase.

Each of the three groups of companies is expected to increase its sales of refined products but at varying rates of increase and therefore shifts will occur in the relative position in 1953 as compared with 1948. For every 100 bbl. of refined products marketed in 1948, 42 bbl. was by American-owned companies and the same quantity was by British and British-Dutch-owned companies. In 1953 the relative position of American companies will fall to 37 bbl. and British and British-Dutch companies will fall to 40 bbl. The decline in the relative marketing position of both is attributed largely to the rise in the relative position of sales by other nationalities, i.e., from a position of 16 bbl. in 1948 to 23 bbl. in 1953.

(Continued on page 253)

TABLE 4—TOTAL MOVEMENT OF CRUDE OIL TO IMPORTING AREAS
(Thousands of barrels daily)

Importing areas and nationality of companies	1948 1,000 bbl. daily	1948 Per cent of total	1953 1,000 bbl. daily	1953 Per cent of total	Increase 1,000 bbl. daily	Increase Per cent	Relative position for each 100 bbl. of crude oil moved to importing areas 1948 (bbl.)	Relative position for each 100 bbl. of crude oil moved to importing areas 1953 (bbl.)
Latin America:								
American	48	23	10	2	‡38	‡79	83	13
British, British-Dutch	10	4	66	9	56	(*)	17	87
Others								
Total	58	13	76	5	18	31	100	100
O.E.E.C. countries:								
American	148	70	492	87	344	232	39	39
British, British-Dutch	212	91	652	87	440	208	57	52
Others	14	100	112	100	98	(*)	4	9
Total	374	82	1,256	88	882	236	100	100
Other Western Europe:								
American	10	5	32	6	22	220	83	89
British, British-Dutch	2	1	4	1	2	100	17	11
Others								
Total	12	2	36	3	24	200	100	100
Asia:								
American	4	2	30	5	26	(*)	100	65
British, British-Dutch			16	2	16			35
Others								
Total	4	1	46	3	42	(*)	100	100
Oceania:								
American			2	(†)	2			14
British, British-Dutch	8	4	12	1	4	50	100	86
Others								
Total	8	2	14	1	6	75	100	100
Total importing areas:								
American	210	100	566	100	356	170	46	40
British, British-Dutch	232	100	750	100	518	223	51	52
Others	14	100	112	100	98	(*)	3	8
Total	456	100	1,428	100	972	213	100	100

*Over 500 per cent. †Less than one-half of 1 per cent. ‡Decrease.
Note: Exporting areas include: North America, Caribbean, Middle East, and Far East.

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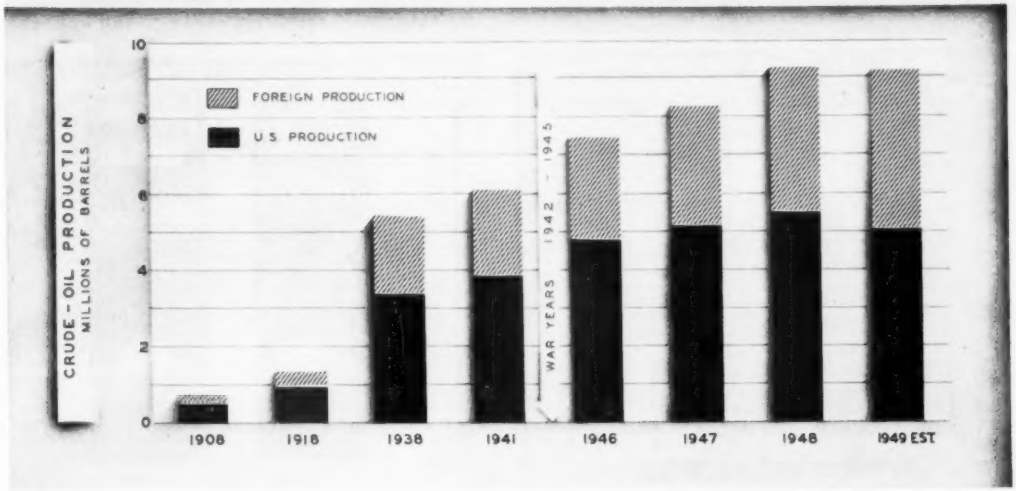


FOREIGN CRUDE PRODUCTION

Total of 3,433,000 bbl. shown for 1949, exclusive of U.S.S.R. and satellites

Rises 10.2%

by Dahl M. Duff
District Editor

FOREIGN crude-oil production exclusive of Russia and Eastern Europe is estimated to average 3,433,000 bbl. daily in 1949, an increase of 10.2 per cent over the preceding year.

This record volume aggregating approximately 940,000,000 bbl. is due principally to increases made in the Middle East. While Venezuela showed a slight decline for the year as a whole, the Persian Gulf area was up more than 20 per cent.

Percentagewise, the gain in non-Russian foreign production more than balanced out the drop in output in the United States. United States production is estimated at 5,038,000 bbl. daily, down about 9 per cent from the 1948 all-time high.

Available data on Russia and Eastern Europe credit this area with 803,100 bbl. daily average this year, although official information is lacking. This represents a gain of 10 per cent over the 725,600 bbl. daily the same countries are believed to have produced last year.

Considered in terms of volume and not per cent, the increases in foreign production, Russian and non-Russian, are not sufficient to offset the 471,000-bbl. daily average decline this year in production in the United States. As a result, indicated world production in 1949 fell about 75,000 bbl. daily, or about 0.8 per cent, to 9,279,800 bbl. daily.

Foreign crude production next year is expected to rise to still higher levels. The total foreign figure may be close to the 10,000,000-bbl. daily mark. An 8 per cent increase in demand outside the United States is generally forecast, with a possible 6 per cent in the United States.

The trend of foreign production has been rising since early summer. Venezuela is back to record production levels, and output in the Middle East as a whole should go somewhat higher, although the spectacular gains of the last few years appear to have been halted.

The most significant trend in world production in 1949 again is the Middle East expansion and the declining percentage of total world output supplied by the United States. The United States furnished 59 per cent of total world production in 1948, and nearly 62 per cent in 1947. Last year this percentage dropped to 54.3.

Of total world production—including Russian areas—the Middle East in 1948 supplied 12.2 per cent. This year the percentage is up to 14.7. For the Western Hemisphere exclusive of the United States, the percentages are 18.9 in 1948 and 19.3 in 1949.

Western Hemisphere

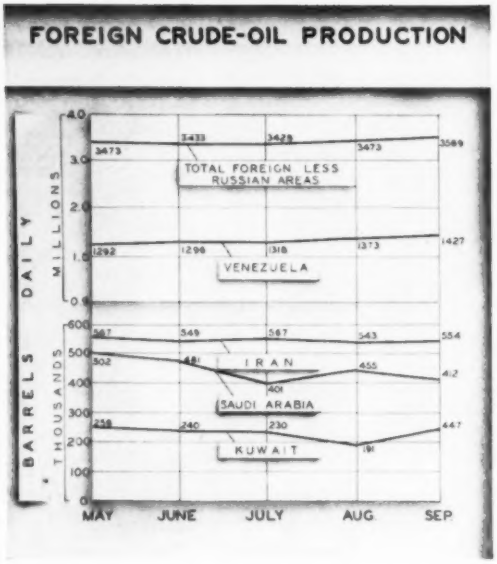
Venezuela's production for 1949 is estimated at 1,320,000 bbl. daily. This is about 1 per cent below the 1,338,800 bbl. produced in the record year of 1948.

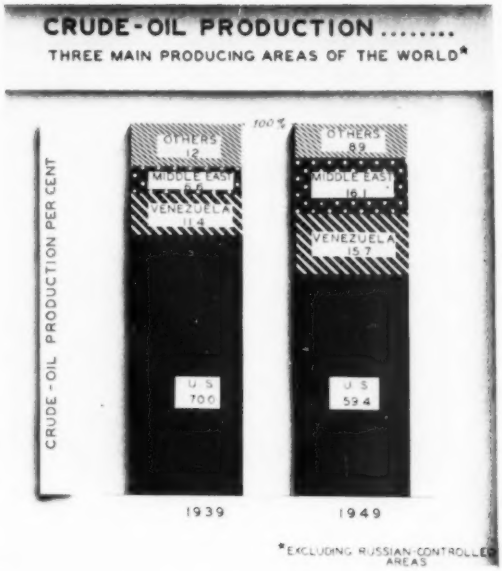
The slump in the heavy-fuel-oil market reacted sharply against Venezuelan production in the early months of 1949. Production fell to 1,156,000 bbl. daily in March but has risen since, and in October another record was established with approximately 1,433,000 bbl. daily.

Of the percentage changes in production from 1948 to 1949, the most significant increase in the Western Hemisphere was shown by Canada. Further development in northern Alberta gives the country an estimated daily average for the year of 58,300 bbl. daily, nearly 80 per cent above the 1948 figure. Current production is more than 68,000 bbl. daily.

Despite the withdrawal of several operators from further exploration in Colombia, that country showed a record production of 82,300 bbl. daily in 1949. This was due to development of Shell's Dificil field, Texaco's Velasquez operation, and continued high production from existing fields.

Next year, Chile will join the list of Western Hemisphere producing countries. The government organiza-





tion has completed a pipe line giving an outlet to its field in the Tierra del Fuego, and initial production is expected at several thousand barrels daily. Brazil's National Petroleum Council also is due to start commercial production of the Bahia fields in 1950 with completion of a 2,500-bbl.-daily refinery.

Most other producing countries in the Western Hemisphere are showing small increases in production this year. An exception is Argentina where, according to unofficial information, production has dropped off slightly. In Peru, the legal situation holds up any considerable wildcatting, but continued careful production and development of existing fields, principally those in La Brea-Parinas, have given a 5 per cent increase this year to 40,500 bbl. daily.

Europe and Africa

Largest producer in Western Europe is Germany where several new and promising fields have been found this year. In 1949 Germany reached its highest production rate since 1944 with a daily average estimated at 16,300 bbl.

Production in 1949 from the Netherlands' Schoonebeek field, located on the Dutch-German border, approximates 11,600 bbl. daily, a level at which withdrawals early in the year were stabilized. Several wildcats have been drilled, and work is under way to test the western portion of the country.

Italy's output is placed at about 200 bbl. daily, the same as in 1948. The government organization, AGIP, attracted considerable attention with its Cortemaggoire discovery last summer, but the full details on this operation have not been disclosed. AGIP was reported planning an ambitious development program, and if the discovery is of significance, it should be reflected in next year's production.

France's 1949 output remains at little over 1,000 bbl. daily, largely from Pechelbronn, and the extensive exploratory drilling program has not yet shown success, except for an as-yet-unevaluated discovery at Soultz-sous-Foret in the Pechelbronn area.

Egypt shows a 36 per cent increase in production in 1949 to bring the country's average for the year to an estimated 42,500 bbl. daily, a record high. The gain results from production of the new fields developed by Shell and Socony-Vacuum east of the Red Sea on the Sinai Peninsula.

Middle East

This Middle East area as a whole gained 20.2 per cent in production as compared to 1948. The increase in 1948 over 1947 represented about 36 per cent, and in 1947 over 1946, 19.3 per cent.

This year, all the five producing countries of the Middle East showed increases. These ranged up to 90 per cent in the case of Kuwait.

Kuwait's rapidly climbing production curve has been the most spectacular of any country since the end of the war. Commercial production did not begin until 1946. Potential is much greater than the current output which has been around 250,000 bbl. daily.

Production this year in Saudi Arabia has fluctuated widely, dropping to a low of about 401,000 bbl. daily in July. The original program contemplated a considerably higher output than the year's average of 460,000 bbl. daily. The decline has been due to unfavorable market conditions resulting from difficulties in the sale of this dollar-produced oil. Arabian American Oil Co. has been particularly affected by these trade difficulties and the sterling vs. dollar-oil problem.

Iran's 550,000 bbl. daily in 1949 represents a 6 per cent gain over 1948. For Iraq, opening of the 16-in. pipe line from Kirkuk to Tripoli in July provided an additional outlet which allowed production to be raised and brought the year's average to an estimated 85,000 bbl. daily. The 1948 output was down because of the closing of the line to Haifa. This outlet is still shut.

All the countries of the Middle East have been at new high record production levels this year, but a more steady rate is likely next year. Imports to the United States have fallen off, and the Persian Gulf crude is meeting more normal demand increases in the Eastern Hemisphere.

Turkey's state-owned oil organization is continuing development of the Ramandag area and is seeking a solution to the refining and distribution problems involved. A makeshift topping plant handles output at present, and the production itself is intermittent. Future expansion in the Middle East also involves operations in the Neutral Zone, the territory near Kuwait's Burghan field where American Independent Oil Co. has begun exploration. Possibilities of production here are considered extremely good.

Far East

Estimates of production in the Far East are less reliable than elsewhere since exact figures are available only up to midyear or earlier. Most noteworthy this year is the success of the Shell organization in developing Seria in British Borneo. Seria has a production in excess of 60,000 bbl. daily.

Continued reconstruction in Indo-

WORLD CRUDE-OIL PRODUCTION

(Barrels daily)

Country—	1949 estimated	1948	Pct. change '49 over '48	1947	1946	1945	1944	1943	1942	1941	1940	1939	1938	1928	1918	1908
W. Hemisphere:																
Argentina	62.5	64.8	—4	59.8	56.4	62.7	66.4	74.3	64.9	60.0	56.5	51.1	46.7	24.9	3.7	
Bolivia	1.8	1.3	39	1.0	1.0	1.0	0.9	0.9	0.8	0.6	0.8	0.6	0.6			
Brazil	0.3	0.4	—25	0.3	0.2	0.2	0.2	0.1	0.1							
Canada	58.3	32.5	79	20.9	20.8	22.2	27.6	27.6	28.4	27.8	23.5	21.5	19.1	1.7	0.8	1.4
Colombia	82.3	64.9	27	71.1	61.6	61.5	61.0	36.4	28.7	67.1	69.8	65.5	59.0	54.4		
Cuba	0.4	0.3	33	0.8	0.7	0.4	0.3	0.3	0.4	0.4	0.3	0.3	0.2			
Ecuador	7.3	7.0	4	6.3	6.4	7.3	8.1	6.3	6.2	4.3	6.4	6.3	5.9	3.0	0.2	
Mexico	165.8	159.5	4	160.0	135.0	119.4	104.7	96.4	95.5	115.8	120.4	117.7	105.6	137.4	174.6	10.8
Peru	40.5	38.4	5	35.0	34.1	37.6	39.2	40.1	37.4	32.8	33.1	37.1	43.4	32.8	6.9	3.0
Trinidad	56.5	54.9	3	52.6	55.2	57.8	60.5	58.5	60.4	60.0	60.8	52.8	48.5	21.0	5.7	0.1
Venezuela	1,320.0	1,338.8	—1	1,191.5	1,063.1	885.4	704.6	487.0	405.0	627.0	508.0	566.0	516.0	289.0	0.9	
Total	1,795.7	1,762.8	2	1,599.3	1,434.5	1,255.5	1,072.9	827.9	727.8	995.8	879.6	918.9	845.0	564.2	192.8	15.3
Europe & Africa:																
France	1.1	1.1		1.1	1.1	0.5	0.8	1.0	1.3	1.1	1.4	1.4	1.4	1.4	1.0	
French Morocco	0.4	0.2	100													
Germany	16.3	12.1	35	11.1	12.1	10.8	16.8	13.7	14.2	17.3	20.2	12.3	10.6	1.7	0.7	2.8
Italy	0.2	0.2		0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.2	0.3	0.3	0.1	0.1	0.1
Netherlands	11.6	9.4	26	4.0	1.2	0.1										
Egypt	42.5	36.0	18	23.6	24.8	25.8	25.8	24.6	22.7	23.4	17.8	12.8	4.3	5.4	5.3	
United Kingdom	0.9	0.9		0.1	1.1	1.5	1.9	2.3	1.7	0.6	0.3					
Total	73.0	59.9	22	40.1	40.5	38.9	45.8	41.8	40.2	42.7	39.9	26.8	16.6	8.6	7.1	2.9
Middle East:																
Bahrein	30.1	29.8	1	25.8	22.0	20.0	18.4	18.0	17.1	18.6	19.3	20.8	22.8			
Iran	550.0	518.5	6	423.2	402.2	357.0	280.0	205.0	198.0	139.0	181.0	214.0	215.0	119.0	2.4	
Iraq	85.0	72.2	17	98.4	97.8	96.2	84.8	68.1	54.0	34.6	66.4	84.3	89.5	2.0		
Kuwait	242.0	127.2	90	44.5	16.2											
Saudi Arabia	460.0	390.3	18	246.0	164.0	58.4	21.4	13.4	12.4	11.8	13.9	10.8	1.3			
Total	1,367.1	1,138.0	20	837.9	702.2	531.6	404.6	304.5	281.5	204.0	280.6	329.9	328.6	121.0	2.4	
Far East:																
British Borneo	68.0	55.0	24	35.6	5.5	5.5	16.5	12.3	8.2	18.8	19.3	19.5	19.0	14.3	1.4	
Burma	0.5	0.5		2.2	1.9	2.0	2.1	2.7	6.8	21.3	21.2	21.6	20.6	24.0	22.4	13.8
India*	5.3	5.3		5.1	6.0	6.4	7.6	7.5	7.7	8.0	6.3	6.4	6.8			
China	1.8	1.8		1.0	1.4	1.3	1.4	1.2	0.9	0.2						
Indonesia	112.0	86.8	29	22.0	5.8	20.8	63.8	132.2	65.8	147.0	170.0	170.5	157.0	88.0	35.0	28.2
Japan	3.5	3.1	13	3.4	3.7	4.2	4.4	4.7	4.5	5.3	7.2	7.3	6.9	5.3	3.7	5.1
New Guinea	4.9	0.4	1,130													
Pakistan*	1.8	1.2	50													
Total	197.8	154.1	28	69.3	24.3	40.2	95.8	160.6	93.9	200.6	224.0	225.3	210.3	131.6	65.5	47.1
Total foreign less Russian controlled	3,433.6	3,114.8	10	2,546.6	2,201.5	1,866.2	1,618.8	1,334.8	1,143.4	1,443.1	1,424.1	1,500.9	1,400.5	825.4	267.8	65.3
Russia and Eastern Europe:																
Albania	1.0	1.0		4.9	2.7	0.7	0.9	2.7	4.4	3.7	4.1	2.6	2.0			
Austria	18.0	17.0	6	17.2	15.7	8.4	22.5	20.5	16.2	11.6	7.7	3.4	1.0			
Czechoslovakia	0.9	0.5	80	0.6	0.5	0.2	0.5	0.5	0.7	0.5	0.4	0.3	0.4	0.3		
Hungary	10.5	10.0	5	11.9	14.1	13.7	17.0	17.4	13.8	8.7	5.2	3.0	0.8			
Poland	2.7	2.7		2.6	2.4	2.1	8.2	9.6	7.6	4.9	10.7	10.7	10.3	15.0	16.5	34.6
Romania	89.0	93.4	—5	78.2	86.3	95.3	71.7	107.3	115.5	111.0	108.0	125.0	132.5	84.3	24.0	22.8
Russia†	680.0	600.0	13	533.0	449.0	424.0	767.0	563.0	634.0	664.0	608.0	605.0	600.0	234.0	75.8	170.5
Yugoslavia	1.0	1.0		1.1	1.2	1.4										
Total	803.1	725.6	11	649.5	571.9	545.8	887.8	721.0	792.2	804.4	744.1	750.0	747.0	333.6	116.3	227.9
Total foreign	4,236.7	3,840.4	10	3,196.1	2,773.4	2,412.0	2,506.6	2,055.8	1,935.6	2,247.5	2,168.2	2,250.9	2,147.5	1,159.0	384.1	293.2
United States	5,038.0	5,509.0	—9	5,087.6	4,750.5	4,694.9	4,584.4	4,125.0	3,799.0	3,841.7	3,697.3	3,465.6	3,327.0	2,463.0	975.1	489.0
Total world	9,274.7	9,349.4	—1	8,283.7	7,523.9	7,106.9	7,091.0	6,180.8	5,734.6	6,089.2	5,865.5	5,716.5	5,474.5	3,622.0	1,359.2	782.2

*Pakistan included in India prior to 1947. †Includes Sakhalin. Bureau of Mines figures converted to barrels daily, used for earlier years.

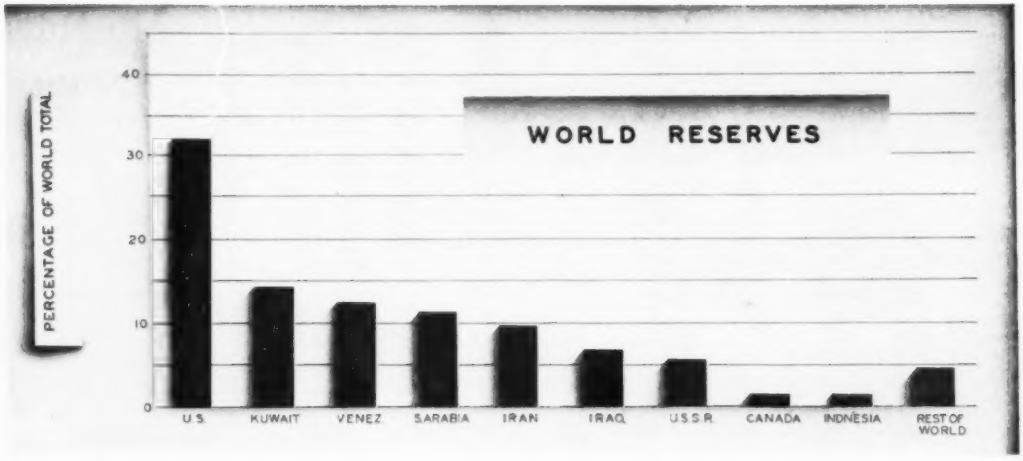
nesia has brought production in these islands to an estimated 112,000 bbl. daily this year, and the rate is continuing to climb. Civil strife in Burma has prevented reconstruction, and the country's production of an estimated 500 bbl. daily in 1949 is only a fraction of the prewar figure. The Vogelkop area of northwest New Guinea was brought into production late in 1948, and further development of this area is anticipated. Exploratory drilling continues in southeast New Guinea.

Russian-Controlled Areas

The industry has been blocked off from all but the most meager information on Eastern Europe since the Communist governments came to power. Reliable reports place Austria's output this year at 18,200 bbl. daily, with the new Matzen area making up for declines in some other fields heavily drawn by the Soviet Mineral Oil Administration.

Romania's production is believed to have been about 93,500 bbl. daily last year. This represented forced production with the Communists attempting to justify their control and ousting of foreign interests. However, output this year is down to about 90,000 bbl. daily, and is expected to drop further in 1950.

Production in Russia itself is almost wholly a matter of speculation. If some of the percentage gains announced by the Soviet Government can be considered in relation to prewar output, the country is now producing at its 1950 goal and average for 1948 is about 680,000 bbl. daily.



Oil Reserves of World

Up 1.5 Billion Barrels

by Dahl M. Duff
District Editor

SUCCESSFUL exploration and development drilling principally in Canada, Venezuela, and Iraq have resulted in substantial additions to crude-oil reserves outside the United States during the past year.

Available information, listed in the accompanying tabulation, indicates that foreign reserves are now of the order of 51,800,000,000 bbl. This compares to a total of foreign reserves estimated at the end of last year as 50,322,000,000 bbl.

On January 1, 1949, estimated reserves in the United States totaled 24,834,000,000 bbl. If this is added to the total foreign the indicated reserve figure is 76,637,250,000 bbl. In January, The Oil and Gas Journal will estimate reserves in the United States as of January 1, 1950. It is probable that the total of that date will exceed the January 1, 1949, estimate.

Both figures, however, include a number of countries on which information is so meager as to place estimates in the category of guesswork. First in this category is naturally Russia. There is no reliable production estimate for that country, and there is even less basis for reserve estimates.

In the Communist-controlled countries of Eastern Europe, reserves were studied and were reasonably well known up to 2 and 3 years ago. There is virtually no information on the results of whatever exploration has been carried out since. Considering the petroleum technology demonstrated by the Russians, the admitted lack of equipment, and other factors, it is doubtful if the operators themselves in these countries have any thorough information of their reserves.

Reserve Increases

Although better bases for estimates are provided elsewhere in the world, it has been pointed out that any reserve analysis involves numerous assumptions. Furthermore, methods used vary considerably. This fact particularly affects estimates in areas outside the United States.

The figures shown in the accompanying tabulation were largely derived from those given in the report of E. DeGolyer, well-known geologist, in The Oil and Gas Journal of December 30, 1948. These estimates have been modified where indicated by discoveries and extensions made over the last year.

Largest additions to reserves outside the United States appear to have been made in 1949 in northern Alberta in Canada. This area is credited with 1,200,000,000 bbl. as against 500,000,000 bbl. last year.

Major factor in South America is Venezuela. The country is now estimated to have approximately 9,500,000,000 bbl., compared to 9,000,000,000 bbl. last year. These figures indicate that during 1949 Venezuela discovered about two barrels for every one produced.

Most geologists agree that substantial additions have been made to Venezuelan reserves during the year. These have been in Boscan, Ruiz, San Roque fields and extensions to La Paz and Mara. The Barinas area also is believed to have added substantially to Venezuelan reserves, though the

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area is not commercially producing.

Elsewhere in South America, a few revisions to the previous reserve estimates have been made. Trinidad's position has been improved slightly as a result of deep drilling, though several of these tests have been unsuccessful.

In Europe, the most significant additions to reserves have been made in Germany. Several new fields have been found, and even the 150,000,000-bbl. figure is considered conservative by some geologists. Italy is still much an unknown quantity, though its prospects are regarded as highly as any in Europe. Some oil was found during the year in the Upper Po Valley but its extent is undetermined.

The discoveries in the Basrah section have been important additions in the Middle East. Further drilling is expected to extend these fields. In Kuwait, a deep test now under way may add to the reserves of Burghan field, but development drilling during the past year has not changed the structural picture. Estimates given for the Middle East may be understated; but as has been pointed out, the question is perhaps academic since the huge known reserves are sufficient to meet production requirements far into the future.

Despite the uncertain geology of the area, the discoveries in the Sinai Peninsula west of the Red Sea in Egypt have added to the reserves of this country. These new fields have allowed production in the country to be virtually doubled in the last 2 years.

Detailed information is lacking on the Far East. Considered most significant are the results obtained in British Borneo. Production here has risen sharply since the war, and considerable development work carried out.

Of interest is the comparison of reserves to production. For Venezuela, production last year was 5 per cent of reserves. Similar percentages are: for Europe and Russia, 6 per cent; Far East, 4.5 per cent; North America less the United States, 4 per cent; and the Middle East, 1.5 per cent.

Global Oil Reserves

	Est. reserves proved and indicated as of Jan. 1, 1950	Approximate 1949 total production
North America:		
Canada	1,200,000,000	21,300,000
Mexico	850,000,000	60,500,000
Cuba	2,800,000	200,000
Total (excl. U. S.)	2,052,800,000	82,000,000
South America:		
Argentina	250,000,000	22,800,000
Bolivia	20,000,000	650,000
Brazil	20,000,000	100,000
Chile	10,000,000	
Colombia	300,000,000	30,000,000
Ecuador	28,000,000	2,600,000
Peru	160,000,000	15,000,000
Trinidad	260,000,000	20,000,000
Venezuela	9,500,000,000	480,000,000
Total	10,548,000,000	571,150,000
Total W. Hemis. (excl. U. S.)	12,600,800,000	653,150,000
Europe:		
Albania	9,000,000	350,000
Austria	75,000,000	6,700,000
Czechoslovakia	2,000,000	330,000
France	4,250,000	400,000
Germany	150,000,000	6,000,000
Great Britain	3,700,000	330,000
Hungary	40,000,000	3,800,000
Italy	2,000,000	680,000
Netherlands	50,000,000	4,250,000
Poland	20,000,000	1,000,000
Romania	350,000,000	32,300,000
U.S.S.R.	4,300,000,000	248,000,000
Yugoslavia	4,000,000	365,000
Total	5,009,950,000	305,505,000
Africa:		
Algeria and French Morrocco	2,500,000	145,000
Egypt	200,000,000	15,500,000
Total	202,500,000	15,645,000
Middle East:		
Bahrein	160,000,000	11,000,000
Iran	7,000,000,000	201,000,000
Iraq	5,250,000,000	31,000,000
Kuwait	11,000,000,000	88,300,000
Saudi Arabia	9,000,000,000	168,000,000
Turkey	3,000,000	
Total	32,413,000,000	499,300,000
Other Asia:		
Burma	50,000,000	180,000
China	20,000,000	650,000
India	25,000,000	1,900,000
Japan	22,000,000	1,280,000
Pakistan	10,000,000	650,000
Indonesia	1,100,000,000	41,000,000
British Borneo	300,000,000	24,800,000
New Guinea	50,000,000	145,000
Total	1,577,000,000	70,605,000
Total East. Hemis.	39,202,450,000	891,055,000
Total foreign	51,803,250,000	1,544,205,000
Total U. S.*	24,834,000,000	1,838,870,000
Total world	76,637,250,000	3,383,075,000

*January 1, 1949. Proved U. S. total for January 1, 1950, will be published in The Oil and Gas Journal Annual Review and Forecast Number, January 26, 1950.

World Tanker Fleet

...now number 1,955 vessels..having 25,000,000 deadweight tons...and average speed of 13.2 knots. U.S. still holds lead

by Benedict Saurino*

A SIGNIFICANT growth has occurred in the world tank-ship fleets during the past decade due to the impetus of war construction. Currently there are 1,955 vessels in the world fleet of approximately 25,000,000 deadweight tons and having an average speed of 13.2 knots. Increases of 74 per cent since September 1939 and 7 per cent since the end of World War II have occurred in the carrying capacity of the world tanker fleet.

Registry by individual flags shows that the United States fleet represents 38.0 per cent of the world's capacity, the British Empire accounts for 20.7 per cent, while Norway's fleet is 12.3 per cent, and vessels under Panamanian registry are 9.6 per cent of the world tanker capacity. In total, the fleets of these four flags account for more than 80 per cent of the world capacity.

Both in deadweight tonnage and speed, the average of the present fleet has increased substantially from the world tank ships existing in September 1939. In combination, these two factors indicate an average per vessel capacity 43.6 per cent greater than the average of the 1939 fleet. Only during the World War I decade from 1909-1919 has a comparable change in ship design occurred. During that decade, the average per tanker capacity increased 42 per cent over the average ship in the 1909 fleet.

Age Groups

Probably the most important single consideration for future replacement programs relates to the concentration of vessels in certain age groups. At present, the average age of the world fleet is exactly 9 years, although six ships built prior to 1900 are still in operation, the oldest having been constructed in 1892. While the United States fleet is the youngest in point of time, nearly 90 per cent of its capacity is less than 10 years old and 87 per cent represents war construction. This compares with the Norwegian fleet which has 50.5 per cent of its capacity less than 10 years old, only 27 per cent of which was constructed during the war. Worldwide, 72 per cent of the present fleet is less than 10 years old, with 60 per cent reflecting wartime construction. It is apparent that the greatest replacement program problem is faced by the United States flag owners.

Substantial transfers from the U. S. Government to private and foreign account have occurred since the end of the war. In total, 73 per cent of the government-owned ships have been transferred since September 1945 to other accounts, with the largest single acquisition having been made by the nonoil group. Presently, oil companies world-wide account for more than 45 per cent of the world capacity, while nonoil owners have nearly 41 per cent and governments have the remaining 14 per cent of

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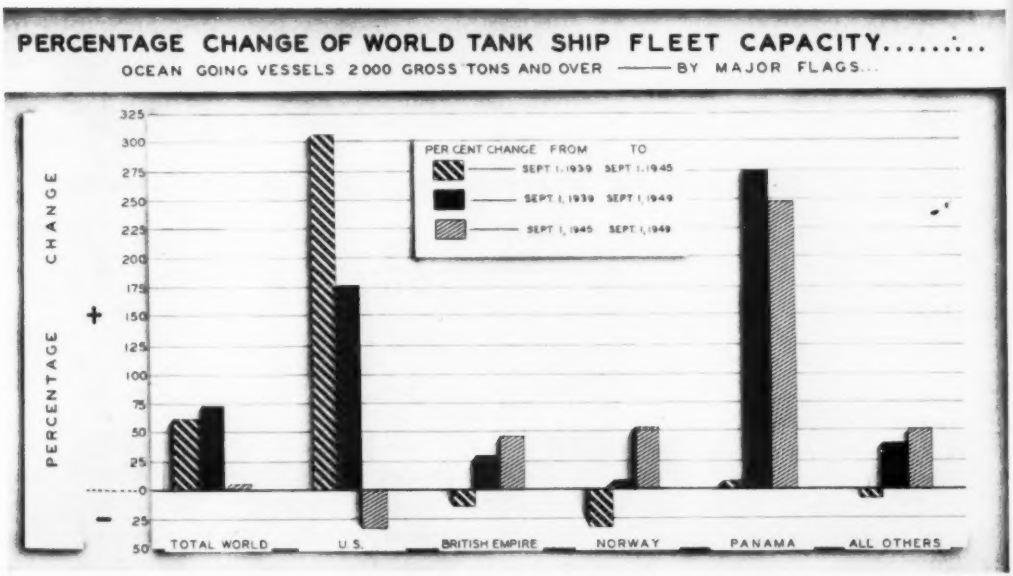

world capacity. Substantial shifts in these group ownerships have occurred since the end of the war. In the United States the nonoil group has more than trebled its tanker capacity since September 1945, while the oil group has increased by 78 per cent, all at the expense of transfers out of the government account.

Operating statistics for the single day September 30, 1949, for the employment of the United States flag fleet indicate that the average round-trip distance covered by the active United States vessels was 5,342 nautical miles. This compares with an average of 5,616 nautical miles reported for the active United States fleet a year ago on September 30, 1948. Primarily, this reduction in the average turnaround distance was due to the fact that on the single day studied this year there were no American flag tankers operating in the Persian Gulf-United States Atlantic Coast trade, while a year ago 25 vessels of 430,800 deadweight tons were active in that trade route. This difference in the operations of the United States flag vessels poses the problem of tanker ships in the long-haul trade as against the utilization of lower-cost foreign-flag vessels in the same operation.

In September 1949 there were 360 tankers of 6,250,000 deadweight tons on order or under construction worldwide whose speed averaged 14.3 knots. They were equivalent to 368

TABLE 1—WORLD TANK-SHIP FLEETS BY FLAG, ACTUAL AND T2-SE-A1 EQUIVALENTS AS OF SEPTEMBER 1, 1949
Ocean-Going Vessels 2,000 Gross Tons and Over

(Source: U. S. Maritime Commission)

Flag—	Actual				T2-SE-A1 equivalent		
	No.	Gross tons	D.W.T.	Average speed (knots)	No.	D.W.T.	As % of world
Western Hemisphere:							
United States	578	5,439,009	8,639,800	14.4	513.2	8,603,800	38.0
Government	131	1,155,572	1,791,000	15.9	117.4	1,968,200	8.7
U.S.M.C.	17	106,786	158,500	10.8	7.1	119,000	0.5
Military	114	1,048,786	1,632,500	16.4	110.3	1,849,200	8.2
Private	447	4,283,437	6,848,800	14.0	395.8	6,635,600	29.3
Oil companies	312	2,979,743	4,776,100	14.0	275.7	4,622,100	20.4
Nonoil companies	135	1,303,694	2,072,700	14.1	120.1	2,013,500	8.9
Panama	176	1,511,969	2,409,000	13.1	129.7	2,174,400	9.6
U. S. citizen	135	1,246,988	1,997,700	13.5	111.3	1,865,900	8.2
Canada	19	141,600	216,700	14.1	12.5	209,600	0.9
Others:							
Argentina	31	189,758	268,500	11.8	13.0	217,500	1.0
Brazil	5	30,077	44,000	10.2	1.8	30,200	0.1
Chile	2	7,586	9,600	11.0	0.4	6,700	0.0
Honduras	7	70,734	114,000	13.9	6.5	109,000	0.5
Mexico	13	80,795	129,800	10.5	5.6	93,900	0.4
Peru	1	2,820	4,300	10.0	0.2	3,300	0.0
Philippine Islands	1	10,052	13,500	16.0	0.9	15,100	0.1
Uruguay	2	20,592	33,600	14.5	2.0	33,500	0.2
Venezuela	35	104,849	143,900	10.1	6.0	100,600	0.4
Subtotal	97	517,263	761,200	11.6	36.4	610,200	2.7
Total Western Hemisphere (including Philippine Islands)	870	7,609,841	12,026,700	14.0	691.8	11,598,000	51.2
Europe:							
ECA countries	997	7,965,945	11,884,500	12.4	606.6	10,169,600	44.9
Belgium	5	41,855	61,000	12.7	3.2	53,600	0.2
Denmark	16	140,683	217,000	11.8	10.6	177,700	0.8
France	64	570,662	855,300	13.0	15.8	767,800	3.4
Greece	11	94,077	149,100	13.5	8.3	139,200	0.6
Italy	66	503,818	772,300	12.6	40.9	670,600	2.9
Netherlands	92	479,862	669,300	11.6	31.9	534,800	2.4
Norway	237	2,107,524	3,194,800	12.6	165.8	2,779,600	12.3
Portugal	6	36,741	55,300	11.9	2.7	45,300	0.2
Sweden	37	344,787	529,600	13.5	29.4	492,900	2.2
Switzerland	2	11,571	17,900	10.3	0.8	13,400	0.1
Turkey	3	19,844	30,000	13.7	1.7	28,500	0.1
United Kingdom	458	3,614,321	5,332,900	12.1	266.4	4,466,200	19.7
Others:							
Finland	6	45,991	67,300	10.5	2.9	48,600	0.2
Poland	1	6,487	9,300	12.0	0.5	8,400	0.0
Spain	21	128,965	176,600	11.4	8.3	139,100	0.6
U.S.S.R.	16	101,201	150,500	11.2	7.0	117,400	0.5
Yugoslavia	2	9,271	13,400	11.1	0.6	10,100	0.1
Subtotal	46	291,915	417,100	11.2	19.3	323,600	1.4
Total Europe	1,043	8,257,860	12,301,600	12.4	625.9	10,493,200	46.3
China	6	43,943	66,200	12.2	3.3	55,300	0.2
India	1	3,391	5,400	8.0	0.2	3,400	0.0
Japan	24	176,001	264,500	12.3	13.4	224,600	1.0
Liberia	9	145,053	246,000	16.3	16.5	276,600	1.2
Pakistan	1	3,065	5,200	9.0	0.2	3,400	0.0
Union of South Africa	1	10,449	16,800	14.5	1.0	16,800	0.1
Total World	1,955	16,249,603	24,932,300	13.2	1,352.3	22,671,300	100.0
Total British Empire	480	3,772,826	5,577,000	12.2	280.3	4,699,400	20.7
Total United States, all flags	841	7,680,870	12,147,900	14.1	704.2	11,805,900	52.1

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T2's, or 27 per cent of the present world capacity. Great Britain, United States, and Sweden, in that order, accounted for 83 per cent of the construction orders. Norway, United States, and the United Kingdom, in that order, will receive nearly 77 per cent of the new tankers when completed. The largest single concentration of new tankers will fall in the 16,000-16,999-deadweight tonnage and 14.0-14.9-knot group, indicating that on the average these new ships will approximate the average of the T2 construction predominating during the past war period. Three vessels of 31,000 tons and a speed of 17.5 knots are being constructed in the United States and are the largest of the new construction group. They will be registered under the United States flag and each is equivalent to about two and one-fourth T2's.

Applying the average scrappage age of 26 years and 5 months established by the experience over the past 28 years and accepting estimated delivery dates for the new construction, it is found that by 1953 there will be a net increase equal to the tonnage now on order amounting to 6,250,000 deadweight tons, or 27.2 per cent of the present world capacity when assuming no scrappage during the next 4 years. On the assumption of full scrappage of 26-year-old vessels, the net increase by 1953 will be about 3,500,000 deadweight tons, or 18.5 per cent over the next 4 years. On the basis of 20-year life for the present vessels, the net increase by 1953 will be 10.2 per cent.

Under the extreme ranges of these assumptions, large variations occur in individual national fleets with Norway showing increases from 49 to 75 per cent and the Panamanian fleet experiencing a decline of 14 per cent under conditions of full scrappage as against an increase of 11 per cent when assuming no scrappage of overage vessels.

TABLE 2—OWNERSHIP OF UNITED STATES PRIVATE TANK-SHIP FLEET AS OF SEPTEMBER 1, 1949

Ocean-Going Vessels 2,000 Gross Tons and Over

(Source: U. S. Maritime Commission)

Owner (including subsidiaries)—	Actual— No.	D.W.T.	Avg. speed (knots)
Oil companies:			
Atlantic Refining Co.	13	220,400	13.9
Barber Oil Corp.	9	150,400	14.5
Cities Service Oil Co.	17	282,400	14.6
Gulf Oil Corp.	43	639,200	13.4
Pure Oil Co.	9	119,600	14.2
Sinclair Refining Co.	13	175,400	13.6
Socony-Vacuum Oil Co., Inc.	21	342,400	14.8
Southeastern Oil, Inc.	5	58,600	12.0
Standard Oil Co. (Ind.)	13	199,800	13.6
Standard Oil Co. (N. J.)	54	898,000	14.6
Standard Oil Co. of California	16	227,600	14.1
Standard-Vacuum Oil Co.	5	82,900	14.5
Sun Oil Co.	20	305,400	13.3
The Texas Co.	26	370,300	14.1
Tide Water Associated Oil Co.	16	212,500	12.6
Union Oil Co. of California	7	100,800	14.0
Other oil companies	25	390,400	14.3
Subtotal oil companies	312	4,776,100	14.0
Nonoil companies:			
Bernuth, Lembcke Co., Inc.	5	67,600	13.1
Independent Tankships, Inc.	6	100,000	14.5
Keystone Tankship Corp.	6	100,500	14.5
Chas. Kurz & Co., Inc.	6	87,600	13.7
National Bulk Carriers, Inc.	25	451,900	15.5
North American Shipping & Trading Co., Inc.	6	100,000	14.5
Paco Tankers, Inc.	8	121,700	13.9
Southern Trading Co.	5	84,000	14.5
United States Petroleum Carriers, Inc.	7	116,900	14.5
Other nonoil companies	61	842,500	13.3
Subtotal nonoil companies	135	2,072,700	14.1
Total United States privately owned fleet	447	6,848,800	14.0
September 1, 1949 total private	447	6,848,800	14.0
Oil	312	4,776,100	14.0
Nonoil	135	2,072,700	14.1
September 1, 1945 total private	261	3,651,219	13.0
Oil	208	2,923,675	12.9
Nonoil	53	727,544	13.4
Change to September 1, 1949 from September 1, 1945			
Actual:			
Total	+186	+3,197,581	+1.0
Oil	+104	+1,852,425	+1.1
Nonoil	+ 82	+1,345,156	+0.7
Per cent:			
Total	+ 71.3	+ 87.6	+7.7
Oil	+ 50.0	+ 63.4	+8.5
Nonoil	+154.7	+184.9	+5.2

In 1940, world tanker capacity was 10½ times the 1914 level. On the average, fleet capacity increased about 27⅓ T2 equivalents each year. This period showed a fairly constant rate of growth. On this basis, and without the occurrence of World War II, a continuation of this normal growth would result in a normal world-wide requirement equivalent to 1,200 T2's by 1954. Applying this normal growth to the 1,352 T2 equivalents in the current fleet would indicate that by 1954 a net addition of 109 T2 equivalents would be necessary for normal growth, or a total of 1,461 T2's. When allowing for scrappage of only the 26-year-old vessels, there will occur an increase of 250 T2 equivalents over the next 4 years or a computed excess of 141 T2's over these derived normal requirements. If scrappage of the 20-year-old and over vessels is assumed, an increase of 138 T2's is indicated, or an amount of 29 T2's or 2 per cent over and above computed normal requirements.

Two additional factors should be considered, namely, the availability of tankers due to the completion of the Trans-Arabian pipe line and the normal layup of tankers for drydocking, repair, and inspection which averages approximately 7.5 per cent of the normally active fleet. These two factors tend to offset one another in the calculation if it is accepted that the maximum planned capacity of the T.A.P. line amounting to 550,000 bbl. per day replaces approximately 104 T2's. The indications are that world fleets will be approximately in balance by the end of 1953.

A second significant conclusion relates to the fact that large positional increases will occur in the United States and Panamanian flag fleets by the end of 1953 at the expense of the rest of the world capacity relative to 1939.

Thirdly, the impact of changes in world tanker fleets will fall most heavily upon United States citizen owners who, through direct or subsidiary companies' control, influence 52 per cent of the world tanker capacity. It is in this segment of the world-fleet ownership that the problem of replacement programing is most acute due to the concentration of war constructed tonnage.

Finally, it should be noted that vessels registered under the United States, United States-owned Panamanian, and under Canadian and ECA country flags approximate 92 per cent of the world capacity. Any action on the part of United States owners, therefore, will affect practically the entire world tanker operations.

TABLE 3—T2-SE-A1 EQUIVALENTS OF TANK SHIPS UNDER CONSTRUCTION AND OR ON ORDER AS OF OCTOBER 1, 1949

Ocean-Going Vessels 2,000 Gross Tons and Over

Country of registry	Country of construction: United States — No.	United States — Per cent: Country of const.	United States — Per cent: Country of reg.	United Kingdom — No.	United Kingdom — Per cent: Country of const.	United Kingdom — Per cent: Country of reg.	Sweden — No.	Sweden — Percent: Country of const.	Sweden — Percent: Country of reg.	Denmark — No.	Denmark — Per cent: Country of const.	Denmark — Per cent: Country of reg.	Netherlands — No.	Netherlands — Per cent: Country of const.	Netherlands — Per cent: Country of reg.	France — No.	France — Per cent: Country of const.	France — Per cent: Country of reg.
United States	81.2	100.0	93.8	2.9	1.9	3.3												
United Kingdom				71.8	46.9	100.0												
Sweden				3.1	2.0	18.2	13.9	19.5	81.8									
Denmark				1.4	0.9	12.6	4.1	5.8	37.0	3.7	35.9	33.3						
Netherlands							1.0	1.4	33.3				2.0	12.9	66.7			
France										0.9	8.7	5.5	3.7	23.9	22.6	11.8	100.0	71.9
Belgium																		
Norway				54.1	34.5	43.7	50.0	70.1	40.4	4.9	47.6	4.0	6.2	40.0	5.0			
Spain																		
Japan																		
Italy																		
Panama				11.4	7.5	78.6												
Argentina				7.2	4.7	55.0	2.3	3.2	17.5				3.6	23.2	27.5			
Poland				1.1	0.7	100.0												
Portugal																		
U.S.S.R.										0.8	7.8	100.0						
Total	81.2	100.0	22.1	153.0	100.0	41.6	71.3	100.0	19.4	10.3	100.0	2.8	15.5	100.0	4.2	11.8	100.0	3.2
Average speed		16.1 K.			13.7 K.			14.2 K.			14.0 K.			14.1 K.			13.7 K.	

Countryof registry	Country of construction: Belgium — No.	Belgium — Country of const. (%)	Belgium — Country of reg. (%)	Norway — No.	Norway — Country of const. (%)	Norway — Country of reg. (%)	Spain — No.	Spain — Country of const. (%)	Spain — Country of reg. (%)	Japan — No.	Japan — Country of const. (%)	Japan — Country of reg. (%)	Italy — No.	Italy — Country of const. (%)	Italy — Country of reg. (%)	Portugal — No.	Portugal — Country of const. (%)	Portugal — Country of reg. (%)	Total — No	Total — Country of const. (%)	Total — Country of reg. (%)	Average speed
United States										2.5	39.7	2.9							86.6	23.5	100.0	16.0 K.
United Kingdom																			71.8	19.5	100.0	13.4
Sweden																			17.0	4.6	100.0	14.1
Denmark										1.9	30.1	17.1							11.1	3.0	100.0	14.3
Netherlands																			3.0	0.8	100.0	13.9
France																			16.4	4.5	100.0	13.8
Belgium	1.0	16.9	100.0																1.0	0.3	100.0	14.0
Norway	0.9	15.3	0.7	6.6	100.0	5.4				1.0	15.9	0.8							123.7	33.6	100.0	13.8
Spain							3.4	100.0	100.0										3.4	0.9	100.0	12.8
Japan										0.5	14.3	100.0							0.9	0.3	100.0	14.5
Italy													1.6	100.0	100.0				1.6	0.4	100.0	16.0
Panama	3.1	52.5	21.4																14.5	4.0	100.0	14.1
Argentina																			13.1	3.6	100.0	15.7
Poland																			1.1	0.3	100.0	12.5
Portugal	0.9	15.3	47.4													1.0	100.0	52.6	1.9	0.5	100.0	12.9
U.S.S.R.																			0.8	0.2	100.0	14.0
Total	5.9	100.0	1.6	6.6	100.0	1.8	3.4	100.0	0.9	6.3	100.0	1.7	1.6	100.0	0.4	1.0	100.0	0.3	367.9	100.0	100.0	14.3
Average speed		14.5 K.			13.5 K.			12.8 K.			15.2 K.			16.0 K.			12.0 K.			14.3 K.	

ECA CHARTS WESTERN EUROPE'S OIL OPERATIONS THROUGH 1952

by Bertram F. Linz

WESTERN Europe's needs for petroleum during the next 31 months having been pretty well charted in the first 20 months of the European Recovery Program, future activities of the Economic Cooperation Administration in the field of oil will be directed toward getting the Marshall Plan countries' refining industries developed against that day in 1952 when the assistance program will terminate.

Some progress already has been made toward lessening Europe's dependence upon the Western Hemisphere for oil and shifting it to the Middle East. That shift will have the effect of curtailing our own exports, but such a change was in the cards almost from the day the vast resources of the Middle East were first realized and, in the view of many, ERP has merely accelerated an inevitable change-over.

The Marshall Plan, although primarily intended to give impetus to the recovery of war-torn Europe and combat the spread of communism, fits well into the administration's overall policy of expanding international trade and particularly increasing imports into the United States with a view to reducing the 5 to 7-billion-dollar excess of exports over imports which has prevailed since the war.

This effort to develop a better balance between exports and imports is due to the compelling fact that the rest of the world can get the dollars with which to buy from us only by exporting to the United States. It was the lack of dollar exchange which kept Europe from making a quick recovery at the end of the war and led to adoption of the Marshall Plan.

The development of a more nearly self-contained European oil industry, supplied from the Middle East, also fits into the thinking of our military leaders, who estimate that in 20 years our population will reach the neighborhood of 164,000,000 and the demand for petroleum will run between 25 and 30 bbl. per capita annually against about 16 bbl. today.

Another war would impose an additional 2 to 3 million barrels per day upon this rapidly growing civilian requirement, which probably could be cut only slightly by rationing without impairing the whole economy, and supplies from outside America might well be cut off. Defense officials, therefore, see this country dependent

TABLE 1—COMPARISON OF ECA AND OEEC ESTIMATES OF DOLLAR OIL REQUIREMENTS

(Thousands of metric tons)

	Fiscal 1950		Fiscal 1949	
	ECA	OEEC	ECA	OEEC
Austria	23	23	28	28
Belgium-Luxembourg	1,104	1,204	1,096	1,246
Denmark	735	735	750	815
France	6,175	6,210	4,480	4,980
German-Bizone	1,000	1,000	1,300	1,308
Germany-French Zone	273	273	174	193
Greece	427	427	366	407
Iceland	70	70	75	95
Ireland	221	221	208	208
Italy and Trieste	1,992	2,579	2,325	2,576
Netherlands	733	1,120	645	701
Norway	438	438	485	485
Portugal	489	514	449	449
Sweden	1,493	1,493	1,361	1,880
Switzerland	562	562	607	607
Turkey	313	335	360	360
United Kingdom	5,738	5,738	5,848	6,588
Total	21,786	23,142	20,557	22,926
Thousands of barrels*	152,502	161,994	143,899	160,482
Thousands of barrels daily	417.8	443.8	394.2	439.7

*Conversion calculated on basis of 7 bbl. per metric ton.

TABLE 2—FINISHED PRODUCTS: PRODUCTION—IMPORTS—CONSUMPTION—EXPORTS, 1952-1953

(Thousands of metric tons)

	Supply				Disposal				
						—Bunkers liftings—			
Countries—	Refinery output (ex ag. basis)	Imports	Substitute fuels	Total supply	Inland consumption	National flag‡	Foreign flag and delivered into cons. stocks†	Exports	Total disposal
Austria	519.0			519.00	519.00				519.00
Benelux (Belgium, Luxembourg, Netherlands)	7,399.0	643.00	40	8,082.00	4,723.00	120	§1,440	1,799.0	8,082.00
Denmark	27.5	1,777.00		1,804.50	1,681.50	110	13		1,804.50
France	17,135.0	180.00	25	17,340.00	12,915.00	1,100		3,325.0	17,340.00
Greece	358.0	628.25		986.25	968.25	12	6		986.25
Iceland		253.00		253.00	146.00	100	7		253.00
Ireland		638.70		638.70	¶638.70	N.A.	N.A.		638.70
Italy (incl. Trieste)	7,329.0	109.00		7,438.00	6,229.00	600		609.0	7,438.00
Norway	31.3	1,794.50		1,825.80	¶1,825.80	N.A.	N.A.		1,825.80
Portugal	341.0	501.10		842.10	703.10	139			842.10
Sweden	1,397.0	2,513.00	40	3,950.00	3,815.00	105	30		3,950.00
Switzerland	90.0	973.00	14	1,077.00	1,077.00				1,077.00
Turkey	55.5	844.50		900.00	740.00	130	30		900.00
United Kingdom	17,306.0	4,734.00	676	22,716.00	18,399.00	3,708		474.0	22,716.00
Trizone	4,200.9	310.90	223	4,734.80	4,173.10	300		259.6	4,734.80
Total	56,189.2	15,899.95	1,018	73,107.15	58,553.45	6,424	1,526	6,466.6	73,107.15
Thousands of barrels*	393,324	111,300	7,126	511,750	409,874	44,968	10,682	45,266	511,750
Thousands of barrels daily	1,077.6	304.9	19.5	1,402.0	1,122.9	123.2	29.3	124.0	1,402.0

*Conversion calculated on basis of 7 bbl. per metric ton. †Bunker liftings national-flag vessels from consignment and nonconsignment stocks paid for in local currency. ‡Bunker liftings foreign-flag vessels from nonconsignment stocks paid for in foreign currency. §Benelux: of which 1,027,000 tons deliveries from home production into consignment stocks and 413,000 tons bunker liftings foreign-flag vessels from nonconsignment stock. ¶Ireland and Norway: Inland consumption figures include ships' bunker liftings. (N.A.) Not available.

TABLE 3—EUROPEAN REFINERY PROJECTS APPROVED FOR ECA FINANCING

Country and location of refinery	Company and principal affiliation	Expansion in capacity (BPD)	Costs		
			ECA dollars*	Other amounts	Total dollars and dollar equivalent†
France:					
Donges, near St. Nazaire	Raffineries Francaises de Petrole de L'Atlantique (French company)	8,000	750,000	8,685,000	9,435,000
Gonfreville (Seine) and LaMede (near Marseilles)	Compagnie Francaise de Raffinage (French company)	‡0	3,150,000	7,850,000	11,000,000
Berre (near Marseilles)	Compagnie de Raffinage Shell-Berre (Royal-Dutch-Shell and French ownership)	26,600	1,850,000	29,800,000	31,650,000
Gravenchon (Seine)	Socony-Vacuum Francaise (Socony-Vacuum Oil Co.)	‡0	850,000	5,150,000	6,000,000
Port Jerome (Seine)	Standard Francaise des Petroles (Standard Oil Co. (N. J.), majority owner also Gulf Oil Co., Atlantic Refining Co., and French ownership	‡0	1,427,500	4,987,500	6,415,000
Italy and Trieste:					
Trieste	Aquila S.p.a. Tecnico Industriale (Italian company)	‡0	4,250,000	3,700,000	7,950,000
Port Marghera (near Venice)	Societa Industria Raffinazioni Olii Minerali (Azienda Generale Italiana Petroli, and Anglo-Iranian Oil Co., owners)	11,600	1,800,000	4,600,000	6,400,000
United Kingdom:					
Shell Haven (near London)	Shell Refining & Marketing Co. (Royal-Dutch Shell)	58,000	10,043,000	48,357,000	58,400,000
Llandarcy (Wales)	National Oil Refineries, Ltd. (Anglo-Iranian Oil Co.)	36,100	7,250,000	40,750,000	48,000,000
Total		140,300	31,370,500	153,879,500	185,250,000

*Amounts authorized to meet dollar exchange requirement for purchase of equipment and engineering services in the United States; in each case the company concerned pays the full amount, in local currency, to the local government. †Calculations for conversion of foreign currencies were made prior to major currency devaluations of September 1949. ‡Where no increase in capacity is shown, project involves lubricating-oil facilities and other improvements.

upon Western Hemisphere oil resources in the event of an emergency, and want to make sure those resources will be adequate.

Military experts agree with the industry that locked-up reserves are of little or no value in wartime and that the national security is best served by a strong domestic industry and a self-sufficient hemisphere. For this reason they do not look with favor upon imports at a level which would hamstring our own industry, but neither do they like the idea of exporting Western Hemisphere oil at rates which would threaten quick depletion of our resources.

The latest available figures on ECA operations show that in its first 18 months (April 3, 1948-September 30, 1949) it issued procurement authorizations for crude and products in the amount of $676,700,000. Of this, the United Kingdom received $210,100,000; France $199,600,000; Italy $60,900,000; Netherlands $38,400,000; Bizone Germany $6,600,000; French zone of Germany $8,000,000; Belgium-Luxembourg $39,600,000; Austria $2,500,000; Greece $15,000,000; Denmark $31,600,000; Norway $17,500,000; Ireland $7,200,000; Sweden $33,100,000; Turkey $2,400,000; Trieste $3,600,000, and Iceland $600,000.

Slightly more than one-third of the money granted ($218,767,000) was for procurement in the United States; $119,000 was for paraffin wax from Canada, and $234,121,000 was for procurement in other Western Hemisphere countries, $32,600,000 for procurement in the participating countries, and $220,145,000 was for oil from nonparticipating countries of which $219,262,000 was from the Middle East and $863,000 from Spain.

For the current fiscal year, the Marshall Plan countries estimated they would require 23,142,000 tons (443,800 bbl. per day)* of dollar oil at an estimated cost of $658,508,000, based on prices prevailing last March, while ECA estimated they would require only 21,786,000 tons (417,800 bbl. per day) to cost $562,542,000. The ERP countries estimated their requirements of nondollar oil would be 30,952,000 tons (593,600 bbl. per day) to cost the equivalent of $714,656,000, making their total estimate of crude and refined products imports 54,094,000 tons (1,037,400 bbl. daily), or 4,320,000 tons (82,900 bbl. daily) more than they anticipated importing during the fiscal year 1949.

While the estimates for fiscal 1950 may be modified to some extent by devaluation of currencies and its concomitant factors, Table 1 shows the basic figures on which the ECA program for this year is being worked out.

While the determination of the oil needs of the Marshall Plan countries was relatively easy and involved no difficult basic questions, the working out of the refinery programs of the individual countries has been nothing but one big problem from the very beginning.

Each of the western European countries has worked out its own program of refinery expansion, and in practically every instance that program is aimed not only at making the country self-sufficient but at providing a surplus which theoretically could be exported to neighboring countries or, in the case of the United Kingdom, to markets outside of Europe, including the United States.

Since the exportable surplus of most countries would be products which neither they nor their neighbors would require, consummation of the programs as originally proposed might well result in the piling up of unmarketable stocks impairing the solvency of the refineries, or products which could be sold only in the United States or in what have always been considered dollar-oil markets.

In the case of the United Kingdom particularly, the proposed expansion program might thus curtail the markets for our own industry both abroad and at home, and it is because of these possibilities that ECA has been slow to approve grants for refinery expansions and British and United States officials have attempted to work out an agreement which will protect the interests of the oil industries of both countries.

This fall, the Organization for European Economic Recovery in Paris approved "in principle" a European refinery program which will give a throughput of 62,400,000 metric tons (1,196,800 bbl. daily) in 1952-53. The original estimate in 1948 was for 65,662,000 tons (1,259,300 bbl. daily) at the end of the European Recovery Program.

A year ago, ECA estimated 42,000,000 tons (805,500 bbl. daily) would be the desirable level to which the European refinery industries should expand. More recently, it has increased its estimate to 50,000,000 or 52,000,000

*Conversion calculated on basis of 7 bbl. per metric ton.

tons (997,300 bbl. daily), not including an 8,000,000-ton (153,400-bbl. daily) expansion program proposed by American companies operating in Europe.

Currently, ECA officials are asking OEEC some pointed questions as to how the latter arrived at its approved figure, such as where France and Italy expect to sell the exportable surpluses which would result if their programs were carried out.

ECA has consistently held that expansion of European oil facilities is justified only to the extent that their output can be sold without the use of discriminatory trade or currency practices or other restrictive trade devices. That boils down to the even simpler proposition that the United States should not finance expansions which could lead only to the displacement of American oil in areas where it traditionally has been used.

On the other hand, while they are not expected to do so, European countries whose programs are cut by ECA might dig up the necessary non-ECA dollars to carry them out in full, and the United States could do nothing about it. The major bar to such action is the realization by the Marshall Plan countries that they probably will have fewer dollars to carry on with after the recovery program terminates.

Basis of Estimates

ECA's estimates of desirable production levels are based on information regarding anticipated consumption. Reports from the American companies operating abroad indicated that the proposed European expansion will increase the production available for consumption from 45,100,000 tons (865,000 bbl. daily) in 1948 to 66,900,000 tons (1,283,000 bbl. daily) in 1952, based on a refinery throughput in Europe of 57,100,000 tons (1,095,000 bbl. daily) plus imports. It is figured that if consumption increases 6 per cent a year this would result in a surplus of 10,000,000 tons (192,000 bbl. daily) while if it increased 7 per cent it would still leave a surplus of 7,700,000 tons (148,000 bbl. daily). The OEEC figures, however, were based on an anticipated increase of 9 per cent, which is felt to be entirely too optimistic.

The OEEC figures for 1952-53 contemplated a refinery capacity of 62,400,000 tons (1,196,800 bbl. daily) with an output of 56,200,000 tons (1,078,000 bbl. daily) against an estimated consumption of 58,500,000 tons (1,122,000 bbl. daily) plus 10,900,000 tons (192,000 bbl. daily) for bunkering with other than American-owned consignment stocks. These estimates were based on assumptions of supply and disposals of petroleum products in the Marshall Plan countries as shown in Table 2.

Even as it approved the individual country programs, however, OEEC expressed some doubt whether it would be possible for some countries to secure enough oil-consuming equipment to justify their plans, and raised some question as to the desirability of some projects, pointing out, for example, that a proposed catalytic cracking unit of 150,000 tons (2,900 bbl. daily) capacity in Portugal seems larger than is really required; that a Turkish project for a 1,000,000-ton (19,000 bbl. daily) capacity refinery near Alexandretta might develop a surplus of products difficult to dispose of, while a pipe line to feed the refinery across 400 miles of rough country from Ramandag would be a costly venture.

Heavy Export Surplus

OEEC also found that the French program would lead to a heavy export surplus, some of it intended for overseas territories but some apparently with an eye to neighboring countries, many of which have their own plans for refinery expansion. Again, reerection in Sicily of a second-hand American refinery would not be in line with the over-all pattern, and Belgium's program might lead to a surplus of motor gasoline which would be difficult to sell, it was commented.

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The original estimates of the Committee for European Economic Cooperation, which preceded OEEC, called for some $1,800,000,000 worth of petroleum equipment over the period of the program, approximately one-third to be financed by the United States and the remainder by the individual countries. These figures now are of interest only as indications of intention, since price changes, devaluation of currencies, and other events have served to modify them.

There is a possibility, of course, that the European refinery expansion programs will be scaled down because of changes in the world oil situation since the time they were originally drafted. The present plans were laid out in 1947 and early 1948 when a great oil shortage appeared to be imminent. Since then, the threat of shortage has been dissipated, and other problems have arisen, some due to materials and prices, others, more recent, to devaluation of currencies. There is also the question whether European oil consumption will in fact increase at the rate it was assumed it would grow.

While these many phases of the problem are being worked out, ECA is moving slowly in committing itself to help the Marshall Plan countries build their oil industries. So far only nine projects have been approved. They provide for an increase in capacity of 140,000 bbl. daily in France, England, and Italy, at an over-all cost of $185,250,000 toward which ECA will grant a total of $31,370,500 and the individual countries themselves will provide $153,879,500, mostly in nondollar currencies at rates prior to devaluation.

Few of the other projects in the "42,000,000-ton (805,500 bbl. daily) program" originally laid down by ECA have yet been submitted to the agency for approval, and it may develop that not more than $10,000,000 of ECA money will be asked to carry these through for another increase of 236,000 bbl. daily. If a 51,000,000-ton (978,000-bbl. daily) program is finally agreed upon, the remaining 160,000 to 180,000 bbl. daily capacity is seen as calling for ECA financing for about one-sixth of the total cost.

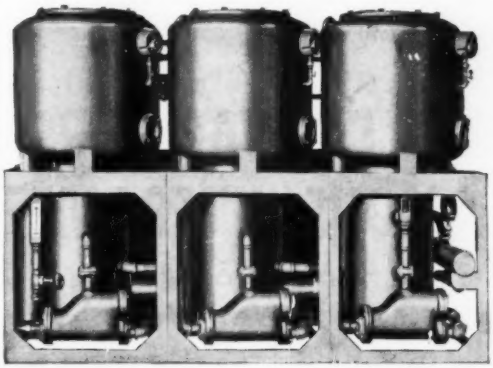
The ECA contribution to the development of European refining is considerably less than the amount which is being spent on European expansions by United States companies, which are estimated to be preparing to spend well in excess of $100,000,000 of their own money.

Currently, ECA officials are pressing OEEC to speed up the process of putting the country programs through the wringer. In a matter of weeks, Economic Cooperation Administrator Paul Hoffman and his aides will have to appear before the House appropriations committee to justify their request for funds to continue the European Recovery Program during the fiscal year which begins July 1. Some members of Congress are becoming critical of the apparent failure of the western European governments to make the intra-European agreements necessary if ERP is to have maximum results. Those agreements would level tariff and other barriers to the free exchange of goods, developing markets for the increased industrial productivity which the program aims to bring about. ECA has warned western Europe that unless it can show concrete progress it will be difficult to secure appropriation of the funds necessary for full continuance of the program.

Russia Supplying Denmark

Denmark and Russia have reached a commercial agreement under which Denmark will import 15,000 tons (about 120,000 bbl.) of Soviet petroleum with delivery expected to be completed in the near future.

The price paid for the Russian oil, though not disclosed exactly, is higher than that for American shipments. However, freight is less, and according to Danish authorities, the final retail price will be about the same as American and English products. Motor fuel was included in the agreement.



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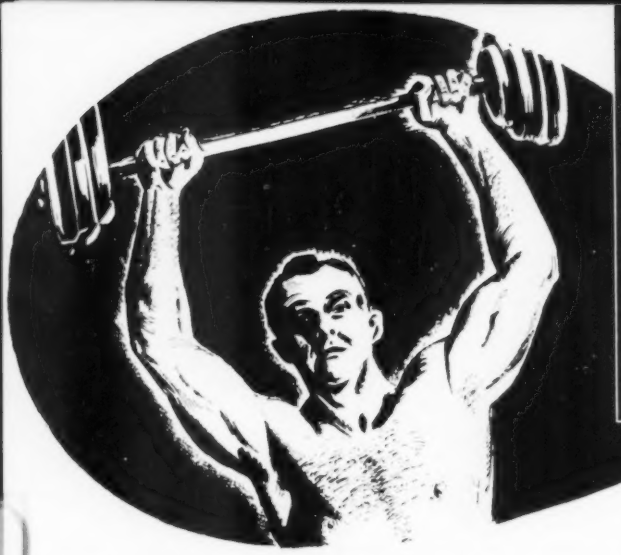

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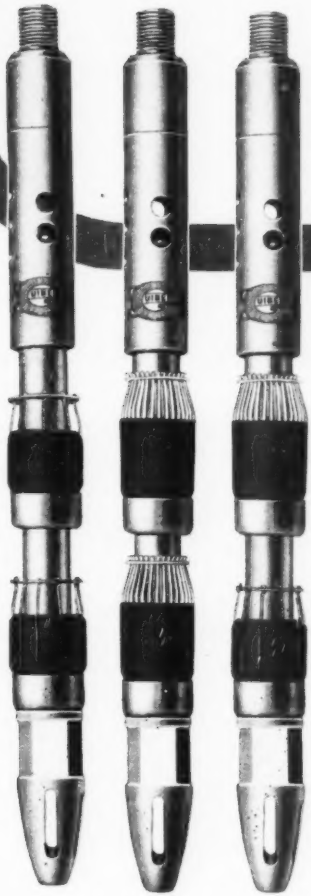

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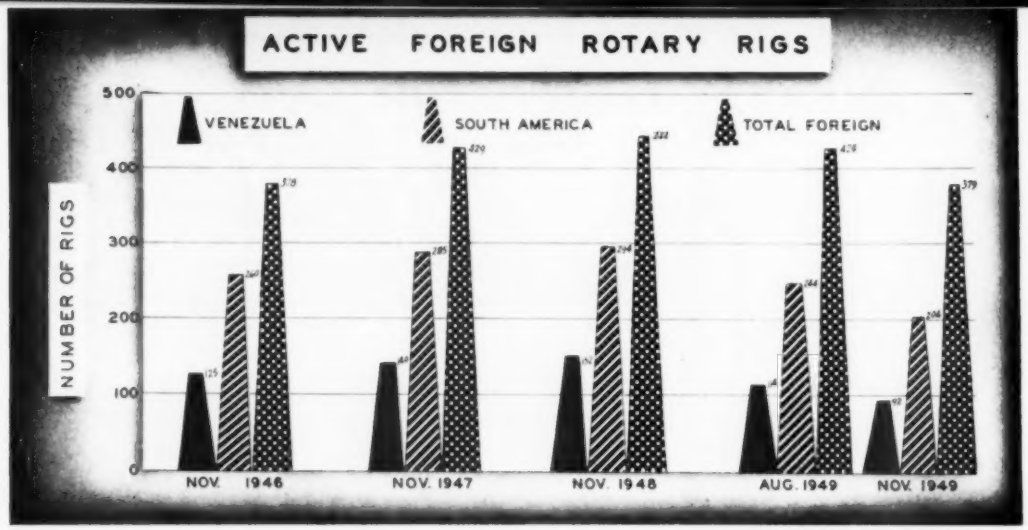

Downward Trend in Foreign Rotary Rigs Operating Appears to Be Checked

by Dahl M. Duff
District Editor

THE number of rotary rigs operating outside the United States has declined sharply over the last year but indications of recent months are that this downward trend has been arrested and that the total may move slowly upward next year.

Reports from various foreign areas show a total of 379 rigs running in November of this year. This compares with a peak of 477 reached in November 1948. The total in late summer was 424.

Of this drop of nearly 100 rigs, 60 occurred in Venezuela. Twenty-two more are accounted for by the reduced scale of operations in Colombia and Peru. Thus of the total reduction, about 80 per cent has taken place in these three countries.

The tabulation excludes Canada which is carried together with the United States, Germany, Japan, and the Russian-controlled areas. No reliable information is available for the latter group of countries.

As for Venezuela, the increasing rate of production in the country gives rise to the possibility that the tempo of drilling operations may be stepped up. Drilling in Venezuela began to fall early in 1949 when production was curtailed. Rigs developing the heavier crude fields accounted for most of the reduction, and exploration work was centered on the deeper light-oil possibilities.

The 92 rigs now reported operating in Venezuela are fewer than the number late in 1946, and it appears that the total of rigs operating has dropped about as far as possible if the current high rate of production is to be maintained. There has been a generally improved outlook for Venezuelan operations in recent months.

The Venezuelan Government is expected to announce a revised oil policy possibly early next year, and the belief is that the country will resume granting concessions. If this occurs, the number of rigs running should rise.

Colombia's situation is due to a general deterioration of exploration work in the country over the last year. Ample reserves elsewhere, unsettled labor and legal conditions, and some discouraging results in the past have contributed to the decline in operations.

The drop in rigs operating in Peru is attributed largely to an unfavorable currency situation in the country whereby until recently only a percentage of dollar proceeds could be withdrawn for equipment and other needs. Peru has recently given a more realistic rate to its currency, liberalized exchange regulations, and is preparing to promulgate a new and favorable oil law. If the law is carried out, it is likely that there will be new drilling by several companies in the coastal regions.

The number of rigs operating in the Middle East also is down, but much less sharply than in Latin America. All the drop in the Middle East is accounted for by reduction operations in Saudi Arabia. Here present facilities support the current reduced level of production. The cause is exchange difficulties interfering with the marketing of Arabian oil, a decline in United States imports, and lower rate of demand in some areas.

Another consideration to bear in mind in considering the totals shown in the tabulation is that much exploration effort and capital that might have gone into other foreign areas has been directed into the tremendous boom in western Canada. Rigs running in western Canada have increased from about 70 to nearly 90 in the last year.

Unsuccessful exploration programs which have been carried out in wildcat areas since the end of the war also are reflected in the table. These include such countries as Bahamas, Panama, Nicaragua. One and two-rig programs such as these are continued intermittently in untested foreign areas. In Palestine, for example, a single rig was operating at the time of British withdrawal. As far as is known, the work has not been resumed since the rig was shut down.

Germany has been meeting some success in its exploration in the last

year. There are said to be possibly 80 rigs of all types operating in the country. Of these, however, only about four are deep, heavy equipment. Much of the drilling equipment in Japan is badly antiquated, but it is reported about four rotaries are running in that country. In addition to the six rigs drilling for oil and gas in Italy, there are reported to be about nine others in the country drilling for steam.

ROTARY RIGS IN OPERATION

North America
(Excluding United States and Canada)

Country	November 1946	1947	1948	1949
Alaska	1	2	2	2
Bahamas	1			
Cuba	2		1	1
Dominican Republic	1			
Haiti	2	1		
Mexico	17	22	34	37
Nicaragua		1		
Panama		1	1	
Total	24	27	38	40

South America

Argentina	43	50	50	42
Bolivia	2	2	2	2
Brazil	5	5	5	5
Chile	2	4	4	4
Colombia	33	29	27	12
Ecuador	10	13	13	13
Paraguay		1	2	1
Peru	21	20	17	10
Trinidad	19	21	22	23
Venezuela	125	140	152	92
Eastern	(87)	(89)	(86)	(49)
Western	(38)	(51)	(66)	(43)
Total	260	285	294	204

Europe
(Excluding Russian-controlled countries and Germany)

England	5	11	9	9
Denmark		1	2	
France	16	15	18	12
Italy	1	5	5	6
Netherlands	4	6	6	6
Spain	2	1	3	3
Total	28	39	43	36

Africa

Algeria		2	2	2
Egypt	10	11	8	7
Ethiopia				1
French Equitorial Africa		1	1	1
Morocco	4	6	6	6
Tunisia		1	2	2
Total	14	21	19	19

Middle East

Bahrein		2	2	2
Iran	9	7	9	9
Iraq	1	3	6	6
Kuwait		5	9	9
Palestine		1		
Qatar, Saudi Arabia	5	7	11	5
Syria & Lebanon		1	4	4
Turkey		1	2	3
Total	15	29	45	40

Other Asia
(Excluding Japan)

Australia		1	2	2
China	2	3	3	3
Burma		1	2	2
East Indies	25	8	15	15
Philippines		1	1	1
India-Pakistan	8	12	12	12
New Guinea	2	2	3	5
Total	37	28	38	40
Grand total	378	429	477	379

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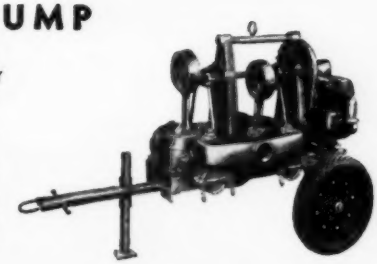

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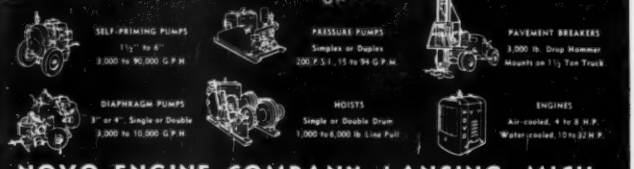

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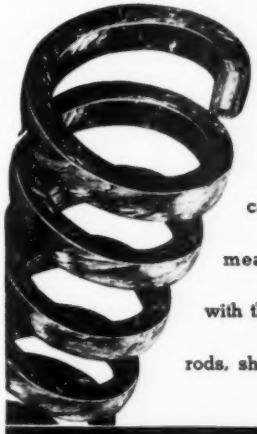

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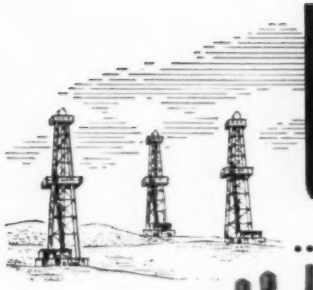

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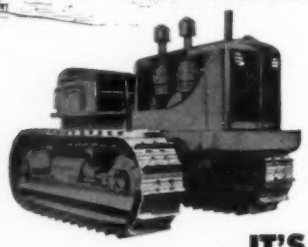

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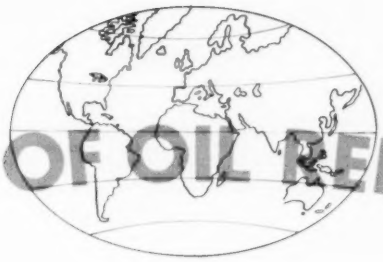

SURVEY OF OIL REFINERIES

Summary of World Refining Capacity

	Number of refineries	Crude capacity (bbl. dly.)	Cracking capacity* (bbl. dly.)
Argentina	18	152,300	89,500
Australia	5	14,000	1,600
Austria	9	26,100	3,700
Bahrein Island	1	150,000	30,000
Belgium	7	15,800	3,500
Bolivia	3	7,200	None
Brazil	4	12,000	2,500
Burma	2	4,000	....
Canada	33	328,800	166,800
Canary Islands	1	10,000	5,000
Chile	2	350	None
China	2	17,850	....
Colombia	2	23,700	None
Cuba	6	7,300	1,100
Denmark	3	620	None
East Indies	8	203,100	58,000
Ecuador	2	4,700	None
Egypt	2	39,000	7,000
Erie	1	600	None
England	16	113,450	10,900
France	16	305,700	73,350
Germany	26	71,130	9,520
Hungary	8	19,700	350
India	1	5,750	1,500
Iran	2	502,100	155,000
Iraq	2	9,000	None
Israel	1	83,000	33,000
Italy	16	107,200	21,600
Japan	12	34,300	1,000
Kuwait	1	25,000	None
Lebanon	1	6,000	None
Mexico	7	160,350	25,900
Netherlands	2	77,000	24,400
Norway	1	1,000	None
Pakistan	1	4,800	2,000
Peru	3	35,000	6,600
Poland	6	7,100	None
Portugal	1	7,500	None
Romania	16	181,500	50,000
Saudi Arabia	1	140,000	20,000
Scotland	4	22,700	4,300
South Africa	1	....	2,000
Spain	2	5,700	5,400
Sweden	4	25,800	2,900
Turkey	1	1,400	....
United States†	374	6,515,505	3,752,390
Uruguay	1	15,700	2,000
Venezuela	15	253,670	32,000
Wales	1	60,600	4,000
West Indies:			
Aruba	2	417,000	231,000
Curacao	1	200,000	280,000
Trinidad	5	104,300	45,000
Yugoslavia	5	8,300	None
Total world (excluding Russia‡)	667	10,544,675	5,164,810

*Includes both thermal and catalytic processes.

†New, expanded or rehabilitated projects scheduled for operation in 1950 included.

‡U.S.S.R. refining operations estimated to total 25 refineries having approximately 650,000 bbl. crude oil daily capacity and 250,000 bbl. per day cracking.

ARGENTINA

Company and address—	Plant location	Crude capacity (bbl. dly.)	Type of refinery	Cracking capacity (bbl. dly.)
"Astra" Compania Argentina de Petroleo, S. A., Avenida Alem 621 (R.I.), Buenos Aires	Comodoro Rivadavia	*2,500	S	None
Cia. General Asfaltos, Buenos Aires	Wilde, Buenos Aires	500	S-L	None
Cia. Nativa de Petroleos, S. A., Ave. Pte. R. Saenz, Pena 567, Buenos Aires	Campana	16,000	Comp	8,800
	Puerto Galvan	5,000	S-A	2,200
Cia. La Isaura, S. A., Ave. Pte. R. S., Pena 699, Buenos Aires	Bahia Blanca	*2,200	S-C	350
Cia. Condor, Levalle 27, Avellaneda	Avellaneda	1,300	S-L	None
Diadema Argentina, S. A., de Petroleo, Roque 788 Saenz Pena, Buenos Aires	Buenos Aires	13,500	S-C	8,000
Lottero-Papinia y Cia., Avellaneda	Avellaneda	300	S-L	None
Standard Oil Co., S. A., Argentina Av. R. Saenz Pena 567, Buenos Aires	Manuel Elordi	1,100	S	None
	Dadin	400	S	None
Ultramar, S. A., Petrolera Argentina, Av. Alem 619, Buenos Aires	Avellaneda	6,000	Comp	1,200

ARGENTINA (Continued)

Company and address—	Plant location	Crude capacity (bbl. dly.)	Type of refinery	Cracking capacity (bbl. dly.)
Yacimiento Petroliferos Fiscales, Avda. Roque Saenz Pena 777, Buenos Aires	Buenos Aires	†2,800	S-C	
	Comodoro Rivadavia	8,000	S-C-L	5,800
	La Plata	‡35,000	Comp.	‡57,000
	San Lorenzo	‡25,000	S-C	2,200
	Plaza Huincul	1,800	S-C	250
	Mendoza, Prov.	†9,000	S-C	2,750
	Chachapoyas	2,100	S-C	950
Total Argentina		152,300		89,500

*Reported shut down. †New refinery planned. ‡Includes planned capacity increases.

AUSTRALIA

Australian Shell Oil Co., Melbourne	Geelong	(*)	S	
Bitumen & Oil Refineries (Australia), Ltd., 115 Pitt St., Sydney	Matraville	3,000	S-A	None
Commonwealth Oil Refineries, Ltd., Scottish House, 90 William St., Melbourne	Laverton	2,500	S	None
National Oil Pty., Ltd., Glen Davis 6 W, New South Wales	Glen Davis		C	1,600
Shell Co. of Australia, Ltd., Shell Corner, 163 William St., Melbourne, C. 1, Victoria	Clyde	†7,300	S-A	None
Vacuum Oil Pty., Ltd. (Standard-Vacuum), 29 Market St., Melbourne	Altona	1,200	S-L	None
Total Australia		14,000		1,600

*Planned for completion in 1951. †Includes 900 bbl. per day topped crude capacity.

AUSTRIA

A. G. der Shell-Floridsdorfer Mineraloel-Fabrik, Schubertring 14, Vienna 1	Vienna (Floridsdorf)	2,500	S-L-A-W	None
Benzine-Benzol-Verband (formerly Oesterreichische Fanto, A.G.), Kerrengasse 17, Vienna	Vienna (Voesendorf)	2,100	S	None
Deutsche Erdoel, A. G.	Ebensee	*1,400	S	None
Deutsche Gasolin, A. G.	Vienna (Korneuburg)	2,900	S	None
Donau-Chemie, A. G.	Moosbierbaum	5,200	S	None
Former German Government	Hauskirchen	*1,400	S	None
Nova Oel—und Brennstoff, A. G., Vienna	Vienna (Schwechat)	3,700	S-C	3,700
Oesterreichische Mineraloelwerke, G.M.B.H. (Socony-Vacuum and Shell)	Vienna (Lobau)	4,800	S	None
Vacuum Oil Co., A. G., Schwarzenbergplatz 18, Vienna	Kagran	2,100	S	None
Total Austria		26,100		3,700

*The Ebensee and the Hauskirchen plants are shut down. All refineries except the Ebensee plant are in the Russian zone of occupation.

BAHREIN ISLAND

The Bahrein Petroleum Co., Ltd., 551 Fifth Ave., N. Y. 17	Persian Gulf	*150,000	S-C-A	†30,000

*Currently employing a portion of catalytic cracking unit in crude-oil topping service. New 55,000-bbl. daily atmospheric unit scheduled for operation in late 1950. †15,000-bbl. daily thermal cracking capacity and 15,000-bbl. daily catalytic cracking capacity; see reference (*).

BELGIUM

Belgian Shell Co., 47 Canterstun, Brussels	Ghent	*1,800	S-L-A	None
Esso Standard (Belgium) S. A., 101 Ave. de France, Antwerp	Antwerp	†1,500	S	None
Raffinerie Belge de Petroles, 116 Ave. de France, Antwerp	Antwerp	†6,000	S-C-A	§3,500
Raffinerie et Distilleries Anversoises, Antwerp	Antwerp	*2,000	S	None
Redventza S. A. Belge Pour le Raffinage de Petrole, 10 Petroleumkaai, Anvers-Kiel	Antwerp-Kiel	300	S	None
Ste. Ame. Belge Pour le Raffinage de Petrole (Albatros), Antwerp	Antwerp-Kiel	3,000	S	None
Tankage et Transport, S. A., 10 Palace Leopold, Antwerp	Antwerp	1,200	S	None
Total Belgium		15,800		3,500

*Topped crude. †Complete new 25,000-bbl.-per-day fuel-oil-products refinery projected for 1952-53 erection. ‡Includes 2,000 bbl. daily of capacity now under construction; work to be completed in 1950. §Thermal cracking 2,000 bbl. daily and reforming 1,500 bbl. per day being built. ‖Shut down. ¶Plans are being considered for increasing capacity to 3,000 bbl. per day on crude oil and addition of reforming unit. Refinery not operating according to current reports.

Note—Ste. Industrielle Belge des Petroles, S. A., 111 Rue du Commerce, Brussels expects to complete its new refinery in 1951.

BOLIVIA

Yacimientos Petroliferos Fiscales Bolivianos, Ave. Gral. Camacho y Bueno	Camiri	1,200	S	None
	Sucre	*1,000	S	None
	Cochabamba	†5,000	S	None
Total Bolivia		7,200		None

*New refinery; additional 3,000 bbl. daily capacity contracted for completion in 1951. †Under construction; completion scheduled for October 1950.

BRAZIL

Conde Matarazzo, Sao Paulo	Sao Caetano	3,500	S	None
Conselho Nacional do Petroleo, Av. Presidente Wilson, 164 Rio de Janeiro	Mataripe	*5,000	S-C	2,500
	Santos	(†)	S	None
	Capuava	(†)	S	None
	Rio de Janeiro	(†)	S	None

BRAZIL (Continued)

Company and address—	Plant location	Crude capacity (bbl. dly.)	Type of refinery	Cracking capacity (bbl. dly.)
Industrias Matarazzo de Energia, S. A. "IME" Precio	Sao Paulo	1,000	S-W	None
Ipiranga S. A. Cia. Brasileira de Petroleos, Saco de Mangueira sem numbro, Rio Grande	Rio Grande	2,500	S	None
Rafinaria de Petroleos do Distrito Federal, S. A. Rua Assembleia, 72, Rio de Janeiro	Rio de Janeiro	(‡)		
Total Brazil		12,000		2,500

*Under construction. Original capacity of refinery (2,500 bbl. daily) is scheduled to be increased to 5,000 bbl. daily. †Planned projects totaling 75,000 bbl. per day. ‡Construction started on this 10,000-bbl. daily plant; completion date indeterminate.

BURMA

All three prewar refineries in Burma were intentionally made inoperative in event of their capture by the Japanese. The refineries were located near Rangoon. Principal one was the Syrian plant of 20,000-bbl. crude capacity and 3,000-bbl. cracking capacity. Burmah Oil Co., Ltd., is now reconstructing its Syrian refinery; however, local insecurity has severely hampered progress. Seikky, another prewar Burma plant, is scheduled for reconstruction by Indo-Burmah Petroleum Co., Ltd. Capacity of this refinery is reported to be 3,000 bbl. per day. Thilawa, the third refinery, prior to its destruction was rated at 2,500 bbl. per day crude-oil capacity. Two refineries are reported to be now operating in Burma. Total capacity of these plants is approximately 4,000 bbl. daily.

CANADA

A detailed listing of the 33 refineries operating in Canada was published on page 282 of The Oil and Gas Journal's annual Refining Number, March 24, 1949. Exclusive of some small topping plants, the total capacity of Canadian refineries		328,800		166,800

Note—The Oil and Gas Journal's 1950 refinery survey is scheduled for publication March 23, 1950.

CANARY ISLANDS (Spain)

Cia. Espanola de Petroleos, S. A., Alcala, 31, Madrid	Sta. Cruz de Tenerife	10,000	Comp.*	†5,000

*Modern lubricating-oil manufacturing facilities to be started on operations early in 1950. †Reforming and polymerization facilities planned for 1950.

CHILE

Corporacion de Fomento, Ramon Nieto 920, Santiago		(*)		

*Refinery planned. Location now under construction. Plans call for 10,000 to 12,000 bbl. daily crude-oil capacity plant with thermal cracking facilities.

Note—Capacity of two small topping plants operating in Chile is reported at 350 bbl. daily total.

CHINA*

Chinese Petroleum Corp.	Kaoshiung, Tiawan, Formosa	†16,850	S-C-A	
	Yumen, Kansu Province, China	‡1,000	S-C	
Total China		17,850		

*Because of China's unsettled political situation, reliable reports on the country's refining operations are not now available. A plant known as the Northwest Refinery was destroyed in 1947 during the early stages of the political disturbances. †Capacity currently is rated at 8,500 bbl. daily. The 8,350-bbl.-per-day crude-oil topping unit and thermal cracker now building at the Kaoshiung refinery was scheduled to be placed in operation early in 1949. This refinery is also equipped with a 1,000-bbl. daily asphalt unit. ‡Facilities at the Yumen refinery consist principally of a combination cracking-topping unit.

COLOMBIA

Colombian Petroleum Co., Cucuta	Petrolea	700	S	None
Tropical Oil Co., El Centro	Barranca-Bermeja	23,000	S-L	(*)
Total Colombia		23,700		None

*Preliminary plans are under way for the construction of a 6,000 to 10,000-bbl. daily thermal cracking unit.

CUBA

Cia. Exploradora de Petroles	Jarahueca	400	S	None
Cia. Petrolera Jarahueca	Jarahueca	600	S	None
Cuban Oil Refining Co., Cabaiquan	Cabaiquan	800	S	None
Destiladora Jarahueca	Santa Clara	200	S	None
Esso Standard Oil Co. (Cuba), Havana	Belot	5,000	Comp.	1,100
Union Gas Co.	Bacuranao	300	S	None
Total Cuba		7,300		1,100

DENMARK

Dansk Mineraloliefabrik	Copenhagen	50	L	None
Det. Danske Pet. Aktieselskab, Sankt Annae Plads 13, Copenhagen	Klundborg	500	A	
L. C. Glad Co., A. S.	Copenhagen	70	L	None
Total Denmark		620		None

DOMINICAN REPUBLIC

Contract for refinery has been awarded to International Industrial Consultants, S. A., by the Dominican Government. Current status of the project is indeterminate relative to location and facilities. Plans call for a plant having an initial capacity of 5,000 bbl. daily and eventual capacity of 25,000 bbl. per day.

EAST INDIES

Company and address—	Plant location	Crude capacity (bbl. d/y.)	Type of refinery	Cracking capacity (bbl. d/y.)
N. V. de Bataafsche Petroleum Mij., Carl van Bylandtlaan 30, The Hague	Balik Papan, Borneo	9,300	S	None
	Tjepoe, Java	*3,000	S-C	2,000
	Wonokromo, Java	2,000	S	None
	Pangkalan Brandan, Sumatra	†19,300	S	None
	Pladjoe, Sumatra	71,000	S-C	25,000
Sarawak Oilfields, Ltd., Miri, Sarawak	Lutong, Sarawak	34,000	S	None
Standard-Vacuum Petroleum Mij., Soengei Gerong, Sumatra	Syngei, Gerong, Sumatra	‡64,000	S-C-W	31,000
	Kappan, Sumatra	500	S	None
Total East Indies		203,100		58,000

*Damaged in civilian disturbances; rehabilitation under consideration. †Inaccessible. ‡Expansion program now under way.

ECUADOR

Anglo-Ecuadorian Oilfields, Ltd., Ancon, Santa Elena	La Libertad	4,000	S-L	None
Ecuador Oilfields, Ltd., Apt. 865, Guayaquil	Cuativo	700	S	None
Total Ecuador		4,700		None

EGYPT

Anglo-Egyptian Oilfields, Ltd., Great Street, St. Helens Court, London, E. C. 3, England	Suez	36,000	S-C-A	7,000
Raffinerie de Petrole du Government, 18 Rue Fouad Ier, Alexandria	Suez	*3,000	S	None
Total Egypt		39,000		7,000

*Plans call for crude-oil capacity to be increased to 3,500 bbl. per day.

ERIE

Cork Harbour Oil Wharves, Ltd., 146 Dashwood House, Old Broad St., London, E. C. 2, England	Haulbowline Is.	600	S	None

ENGLAND

Anglo-American Oil Co., Ltd.,* 36 Queen Anne's Gate, London, S. W. 1	Fawley, Kants	†19,000	S-C-A	†6,000
Berry, Wiggins & Co., Ltd., Field House Breams Building, Fetter Lane, London, E. C. 4	North Rochester	§2,000	S	None
	Salford	1,500	S	None
British Bitumen Refinery	Thames-Haven	1,000	S	None
Cory Brothers & Co., Ltd., 57/59 St., Mary Axe, London, E. C. 3	Coryton, Essex	4,000	S-C-A	2,000
Lobitos Oilfields, Ltd., 146 Dashwood House, Old Broad St., London, E. C. 2	Ellsmere Port	2,200	Comp	‡900
London & Coastal Oil Wharves, Ltd., 3 St. Helen's Place, London, E. C. 2	Canvey Island	1,500	S	None
London & Thames Haven Oil Wharves, Ltd., 3 St. Helen's Place, London, E. C. 3	Thames-Haven	10,000	S-A	None
Major & Co., Ltd., London	Hull	1,250	S-L	None
Manchester Oil Refinery, Ltd., Twining Road, Trafford Park, Manchester 17	Trafford Park	2,800	S-L-W	None
Petrochemicals, Ltd., Partington Industrial Estate, Urmston, Manchester	Urmston		C	£2,000
Shell Refining & Marketing Co., Ltd.	Heysham††	34,000		
Shell Refining & Marketing Co., Ltd., and Starhaven Refineries, Ltd., Norman House, 105-109 Strand, London, W. C. 2	Shellhaven	**16,000	L-A	None
Starhaven Refineries, Ltd., and Shell Refining & Marketing Co., Ltd.	Stanlow	**16,700	L-A	
W. H. Keys	Portishead	500	S	None
	West Bromwich	400	S	None
Total England		113,450		10,900

*Formerly AGWI Petroleum Corp., Ltd. †Expansion to 110,000 bbl. per day under way. Anglo-American Oil Co., Ltd., is also building a 13,000-bbl. daily SO_2 plant. ‡Current expansion project scheduled for completion in 1952, includes catalytic cracking facilities. §A large program is projected for extending current refining capacity. Equipment to include latest design distillation units for processing Middle East crude oil. ¶Cracking plant throughput to 1,150 bbl. daily, planned. Lubricating-oil treating facilities being extended. ||Refinery is equipped with vacuum fractionator, solvent extraction and dewaxing processes. An additional 100,000 bbl. of storage capacity is now being installed. £Charging stock for this plant is a petroleum distillate. Processing facilities consist of catalytic cracking, low temperature gas separation, atmospheric, vacuum, azeotropic and rerun distillation. Products are olefinic and aromatic chemicals. **The Shell organization operates a petrochemical plant at Stanlow for manufacture of various chemical products of petroleum origin. Associated with the petrochemical plant are the Shellhaven and Stanlow refineries. The Stanlow plant manufactures chemical products; topped crude and various distillates capacity. ††Formerly government-owned refinery.

FRANCE

Cie. Francaise de Raffinage, 11 Rue du Doctor Lanceraux, Paris 8	Gonfreville-l-Orcher	*43,000	S-W-A	†19,900
	La Mede	‡39,000	S-C-A	§17,100
Cie Industrielle des Petroles, 54 Rue de Londres, Paris 9	Frontignan, Herault	9,000	S-L-W	None
Cie de Raffinage Shell-Berre, 29 Rue de Berri, Paris 8	Berre	25,000	Comp	¶6,850
	Petit-Couronne	38,100	Comp	4,500
	Pauillac	4,300	S-A	None
Les Propetrol Consommateurs de Petrole	Brest	10,300	S	None
Pechelbronn S. A., d'Explorations Minieres, 32 Allee de la Robert Sau, Strasburg	Merkwiller	1,500	S	None

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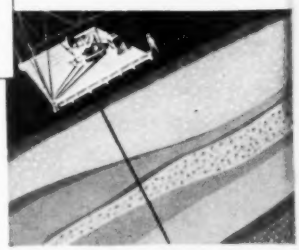

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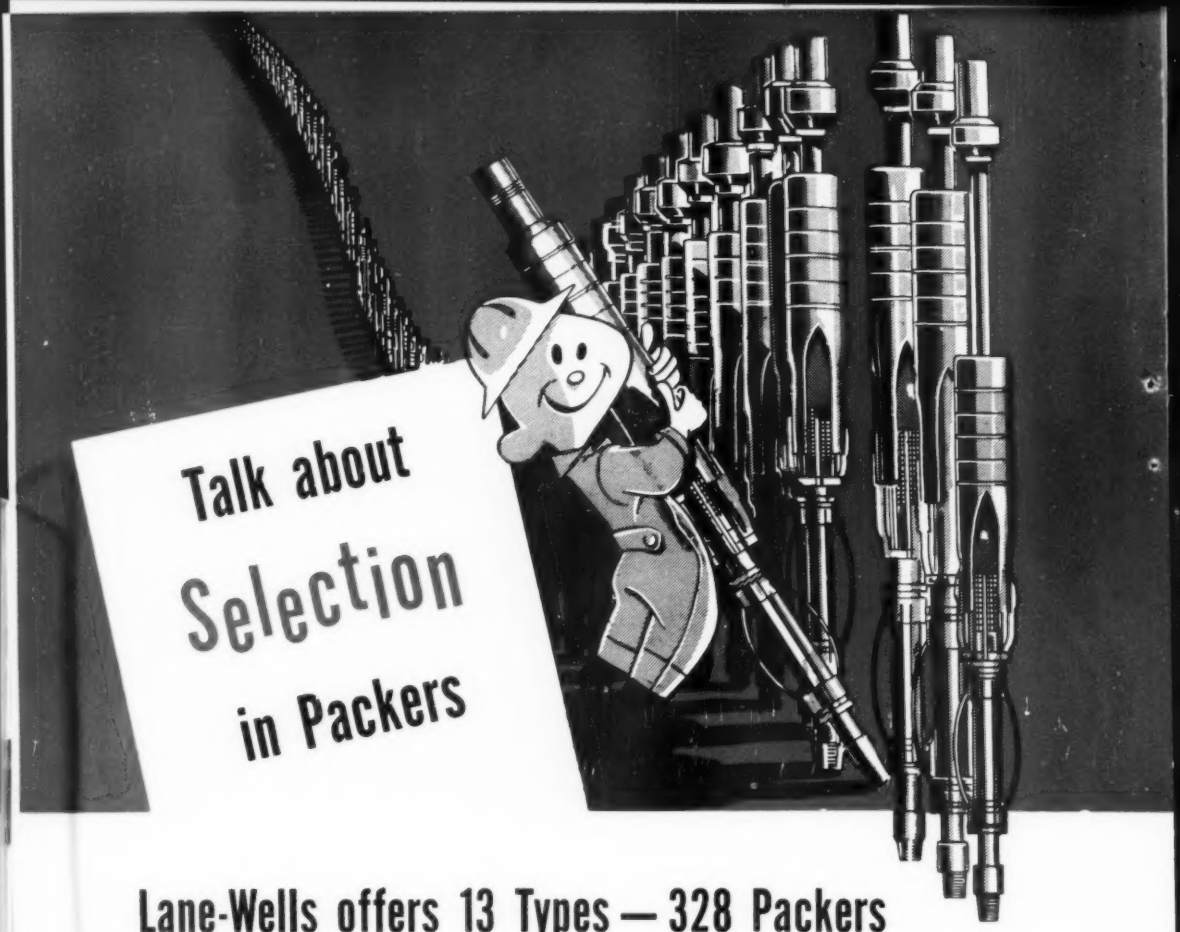

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FRANCE (Continued)

Company and address—	Plant location	Crude capacity (bbl. dly.)	Type of refinery	Cracking capacity (bbl. dly.)
Raffineries Francaises des Petroles de Atlantique, Donges, St. Nazaire	Donges	18,000	S-L	None
Ste. de Raffinage des Huiles de Petrole, 19-21 Rue de la Bienfaisance, Paris 8	L'Avera	36,000	S-C	7,200
Ste. des Raffineries de Petrole de la Gironde, 7 Place Vendome, Paris	Ambes	‡13,000	S-C	**2,500
Ste. Generale des Huiles de Petrole, 19-21 Rue de la Bienfaisance, Paris 8	Courchelettes	(††)		
	Dunkerque	(††)		6,000
Socony-Vacuum Francaise, 46 Rue de Courcelles, Paris 8	Notre Dame de Gravenchon	8,000	S-C-L	2,500
	Frontignan	20,000	S-C	**2,500
Standard Francaise des Petroles, 82 Champs Elysses, Paris 8	Notre Dame de Gravenchon	40,000	Comp.	5,800
	Le Trait	500		None
Total, France		305,700		73,550

*A new 20,000-bbl. daily two-stage distillation unit and new tannin solutizer unit are to be put into operation during 1950. †Includes 13,400 bbl. per day of cracking and reforming capacity and 6,500 bbl. daily of vis-breaking capacity. ‡A new two-stage distillation unit of 20,000-bbl. daily capacity and a new tannin solutizer are to be placed on stream in 1950. §Cracking capacity includes 11,500 bbl. daily of reforming and thermal cracking facilities and 5,600 bbl. per day vis-breaking. ¶Cracking capacity includes thermal process and catalytic processes. ‖A thermal cracking unit operating to process 14,600 bbl. daily. Thermal operations consist of reforming. Expansion now in progress will increase plant capacity to 65,000 bbl. daily. £Reconstructed war damaged facilities. **Reforming capacity. ††Courchelettes plant being moved to Dunkirk where facilities are being installed for processing crude oil and for wax and lubricating-oil manufacture. Capacity of the installation is rated at 33,000 bbl. daily for crude oil. Completion of the project is scheduled for late 1951.

GERMANY

American Zone of Occupation

Zeller and Gmelin, Eislingen, Wuerttenberg	Eislingen	150	S-L	None

British Zone of Occupation

Deutsche Erdoel, A. G., Wietze, Kries Celle, Niedersachsen	Heide-Holstein	2,800	S	None
	Wilhelmsburg	*2,300	S-L-W	None
	Wietze, Kreis Celle	950	S-L-A	None
Deutsche Gasolin, A. G., Hannover, Jordanstr. 32	Dollterger-Lehrte, Hannover	2,000	S-L-A	None
Deutsche Shell, A. G., Shell Haus, Hamburg 36, Alstar Ufer 45	Harburg	*8,400	S-L-A	None
	Manheim	1,700	S	None
	Grasbrook	†1,300	L	None
	Reisholz	†930		None
	Wilhelmsburg	†560		None
Deutsche Vacuum Oel, A. G., Bartholomay-Haus, Steinstrasse, 5-7 (24a), Hamburg	Bremen	12,500	S-L-W	None
	Holstein	†700	S-L-W	None
Ebano-Asphalt-Werke, A. G., Neuer Jungfernsteig 21, Hamburg	Harburg	§10,000	S-L-A	None
Ernst Schliemann's Oelwerke, Hamburg 1, Spitalerstr.	Grasbrook	†470	L	None
Europaische Tanklager und Transport, A. G., Ferdinandstrasse 29/31, Hamburg 1	Hamburg	¶10,000	S-C	5,800
Gewerkschaft DEURAG-NERAG, Hannover, Hindenburgstr., 27/29	Misburg n. Hannover	7,500	Comp.	3,300
Johann Haltermann, Hamburg 1, Ferdinandstr., 55/57	Wilhelmsburg	1,200	S	None
Mineraloelwerke Albert Sengewald, Dedenhausen, Hannover	Dedenhausen, Hannover	£470	S	None
Mineraloel and Asphaltwerke, A. G., Hamburg 1, Ferdinandstr., 29/31	Ostermoor-Holstein	**2,400		None
Mineraloelwerke Albrecht and Co., Hamburg 1, Glokengiesserwall 2	Grasbrook	†230	L	None
Mineraloelwerke Ernst Jung, Hamburg 1, Alsterdamm 16-18	Wilhelmsburg	†120	L	None
Mineraloelwerke Peine, Peine, Hannover	Peine, Hannover	350	S-L	None
Oelwerke Julius Schindler, G.m.b.H., Hamburg 36, Hohe Bleichen 28	Wilhelmsburg	†700	S-L	None
Wintershall, A. G., Celle, Stoerckenstrasse	Salzbergen	1,200	Comp.	420

French Zone of Occupation

Badische Anilin and Soda-Fabrik, Ludwigshafen	Ludwigshafen	(‡‡)		None

Russian Zone of Occupation

Mineraloelwerke Leutzkendorf, Vereiningung Volkseigener Betriebe (Z) Kohlenwertstoffe, Lutzkendorf near Merseburg, Saxonia	Luetzkendorf	2,200	S-L-W-A	None
Total, Germany		71,130		9,520

*War damaged—rebuilding. †Semifinished products processed. ‡1,400-bbl.-per-day capacity under construction. §Refinery being expanded to take care of tributary requirements. ¶Rehabilitation of combination unit under way. When completed capacity or refinery will be raised to 10,000 bbl. daily. Current capacity is 4,500 bbl. per day. ‖Gasoline rerun operation. £Not operating. **Original 1,200-bbl.-per-day refinery not operating. Reconstruction of war-damaged plant will provide 2,400-bbl.-per-day capacity. ††Charge composed of 400 bbl. per day of semifinished stocks and 300 bbl. per day of crude oil. ‡‡Plant operates to treat oil from Badish oil fields.

HUNGARY

Fanto Associated Hungarian Oil Co., Ltd., Budapest 5	Budapest	1,100	S-L	None
Hazai Koolajipar R. T., Budapest	Budapest	1,100	S-L	None
Magyar Hydrobenzin R. T. D., Nador-Utca, Budapest	Petfurdo	1,200	S-C	350
Magyar Olaj Nuvek, Budapest	Szony	7,500	S	None
Magyar Petroleum-Dr. Freund, Budapest	Budapest (Csepel)	4,000	S	None
Nyirbogdanyl Petroleumgyar R. T., Budapest	Nyirbogdany	300	S-L	None
Shell Mineral Oil Co., Ltd. of Hungary, Josef Nador ter 5-6, Budapest	Budapest (Csepel)	(*)	S-L-A-W	None
Vacuum Oil Co., R. T. V., Budapest	Fuzito	4,500	Comp.	None
Total, Hungary		19,700		350

*Information on current operational status and capacity not available. Capacity given on other refineries is from latest available information.

INDIA*

Company and address—	Plant location	Crude capacity (bbl. dly.)	Type of refinery	Cracking capacity (bbl. dly.)
Assam Oil Co., Ltd. (Burmah Oil Co.), Britannic House, Finsbury Circus, London, England	Digboi	5,750	Comp.	1,500

*A technical survey committee of eight oil experts is studying the proposed construction of two refineries in India, one on the east and one on the west coast. A plant of about 40,000 bbl. daily may be established in Madras Province as a result of the combined efforts of several American oil companies.

IRAN

Anglo-Iranian Oil Co., Ltd., Britannic House, Finsbury Circus, London, E. C. 2	Abadan	500,000	S-C-A-L	*155,000
Kermanshah Petroleum Co., Britannic House, Finsbury Circus, London, E. C. 2	Kermanshah	2,100	S	None
Total Iran		502,100		155,000

*Includes catalytic cracking facilities (30,000 bbl. per day) being constructed. A 22,000,000 cu. ft. gas-recovery unit is being erected at Abadan for Anglo-Iranian. This project is scheduled for completion March 1951. A 400-bbl.-per-day lubricating-oil plant is also under construction.

IRAQ

Iraq Petroleum Co., Ltd., City Gate House, Finsbury Circus, London, E. C. 2	Baba Gurgur*	1,500	S	None
Khanaqin Oil Co., Ltd., Britannic House, Finsbury Circus, London, E. C. 2	Alwand	7,500	S	None
Total Iraq		9,000		None

*Iraq Petroleum Co., Ltd., also operates, in Kirkuk field, a 270,000-bbl.-per-day crude-stabilization plant for removal of H_2S.

ISRAEL

Consolidated Refineries, Ltd., Britannic House, Finsbury Circus, London, E. C. 2	Haifa	*83,000	S-C	33,000

*Refinery shut down because of political situation.

ITALY

"Aquila" S. A. Tecnico-Industriale, Trieste	Trieste	10,000	S-L*	None
Azienda Nazionale Idrogenazione Combustibili, Milano Via Albania, 20	Bari	15,000	S-C-A	8,000
	Livorno	5,000	S-C-A	2,000
Distillazione Italiana Combustibili, Soc. An., Venice	Porto Marghera	5,600	S-C	3,500
Industrial Raffinazione Oli Minerali, Via Bertolonizg, Rome	Porto Marghera	†9,400	S-C	1,600
Lombarda Petroli	Villasanta	800	S	None
Permolio	Milan	1,200	S	None
	Genoa	1,200	S	None
	Fiorenzuola d'Arda	500	S	None
	Rowe	1,600	S	None
Petroli d'Italia	Fiorenzuola d'Arda	300	S	None
Raffineria de Napoli S.P.A., Casella Postale 269, Naples	Naples	33,000	Comp.	‡5,000
Raffinerie Siciliane Oli Minerali, S. A., Augusta, Sicily	Megara	§11,000	S	
Soc. per l'Industria Italiana del Petrolio, Plaza della Vittoria, Genoa	Spezia	10,300	S-C-A	1,500
Soc. Petrolifera Italiana, Fornovo-Taro	Fornovo	400	S	None
Standard Italo-Americana-Petrolio, 40 Via Assarotti, Genoa	Trieste	2,500	S-L-A	None
Total Italy		107,200		21,600

*Lubricating-oil facilities under construction. The 30,000-ton yearly plant is scheduled for completion June 1951. †Current capacity 9,400 bbl. daily. Combination unit now in planning stage will increase capacity to 12,000 bbl. per day. ‡Current cracking capacity is 570 bbl. daily which is to be increased with the revamping of existing facilities. §This refinery originally erected in the United States was purchased early in 1949 by interests in Italy. The plant was dismantled and shipped to its new location in Sicily for reassembly.

Note—A number of small topping plants, totaling approximately 500 bbl. daily capacity, are reported to be operating in various sections of Italy. Construction of a new 10,000-bbl. daily plant in north Italy is planned by Societa per Anzioni Raffineria Padana Oli Minerali (California Texas Oil Co., Ltd.).

JAPAN

Maruzen Oil Co., Ltd., No. 2, Mita-Shikoku-machi Minato-ku, Tokyo	Shimotsu	5,000	S-L-W	None
	Okaga	(*)		
Mitsubishi Oil Co., Ltd., No. 8, 2 Chome, Marunochi, Chiyodaku, Tokyo	Kawasaki	†4,500	Comp.	(†)
Nippon Oil Co., Ltd., No. 10, 3 Chome, Marunochi, Chiyoda-ku, Tokyo	Akita	4,700	S-L-A	None
	Niigata	2,000	S-L-W-A	None
	Kashiwazaki	1,285	S-W	None
	Hokkaido	315	S	None
	Yokohama	6,000	Comp.	1,000
	Kudamatsu	6,000	S-L	None
Nippon Kohyo	Funkawa	3,000	S-L	None
Showa Oil Co.	Hirasawa	750	S-L	None
	Niigata	750		
Total Japan		34,300		1,000

*Rehabilitation of war-damaged refinery in scheduled for completion in 1950. Capacity rating on the rebuilt plant may not be determined until salvaging operations have been completed and the extent of reclaimed items evaluated with respect to their use-

fulness as processing equipment. †Reconstruction of this war-damaged installation is now under way. During 1950 the combination cracking-topping unit and its accessory equipment, the lubricating-oil plant, the asphalt and grease plants are expected to be placed in operation. The other facilities, an isooctane plant, a dehydrogenation plant, a paraffin cracking and polymerization unit, and a dewaxing unit will be rehabilitated later.

Note—On July 13, 1948, restrictions regulating rehabilitation of refining facilities in occupied Japan were removed by United States occupational forces.

KUWAIT

Note—Construction work is nearing completion on a 25,000-bbl. topping plant in Kuwait Oil Co., Ltd. The plant is designed to serve only local needs, principally ship bunkering.

LEBANON

Company and address—	Plant location	Crude capacity (bbl. dly.)	Type of refinery	Cracking capacity (bbl. dly.)
Iraq Petroleum Co., Ltd., P. O. Box 118, Tripoli, Lebanon	Tripoli	*6,000	S	None

*Construction of a butane-recovery plant and a gasoline-redistillation unit is planned for 1950. Refinery capacity is to be doubled according to current plans.

MEXICO

Operational status and current capacities of the seven Mexican Government refineries are reported in the Refining Number of The Oil and Gas Journal, March 24, 1949, page 285. Total capacity for operating refineries in Mexico		160,350		25,900

Note—The Oil and Gas Journal's 1950 refinery survey is scheduled to be published March 23, 1950.

NETHERLANDS

Caltex Petroleum Maatschappij, N. V., The Hague	Pernis	*20,000	S-C	6,400
N. V. de Bataafsche Petroleum Mij., Carel van Bylandtlaan 30, The Hague	Pernis	†57,000	Comp.	18,000
Total Netherlands		77,000		24,400

*Building, completion scheduled for early 1950. †Considering increasing crude-oil capacity to 70,000 bbl. daily. Currently, 16,000 bbl. per day of crude oil is processed in thermal cracking facilities.

NORWAY

A S Ostlandske Petroleumscompagni, 3A Prinsengate, Oslo	Vallo	*1,000	S-L-A	None

*Refinery being rehabilitated, completely destroyed in war. Operations expected to be started in late 1950.

PAKISTAN

Attock Oil Co., Ltd., 24-28 Lombard St., London, E. C. 3	Rawalpindi	4,800	Comp.	2,000

PERU

Cia. de Petroleo Ganso Azul, Ltd., Boza 892, Edificio San Martin, 4 Piso, Lima	Agua Caliente, Rio Pachitea	1,000	S	None
Establecimiento Industrial de Zorritos (Peruvian Government), Apartado 130, Calle Constitution 25, Callao	Zorritos	1,000	S	None
International Petroleum Co., Ltd., Talara	Talara	33,000	Comp.	6,600
Total Peru		35,000		6,600

POLAND

Nationalized by Polish Parliament decree, refineries along with other industries are in the hands of government officials for account of the state. Poland's refining industry was rated at 23,000 bbl. per day before the war. Little information is available on present operations. The following list of plants is compiled from information in The Oil and Gas Journal files:

(Formerly Vacuum Oil Co.)	Czechowice	1,250	S-A-W-L	None
(Formerly owned by the "Malopolska" group—French)	Glinik Mariampolski	1,250	S-W	None
	Jedlczo	850	S-L	None
	Trezabinia	2,500	S-L	None
	Jaslo (reconstructed)	1,000	S-L	None
(Formerly owned by the Fink group—Polish)	Ligota	250	S-L	None
Total Poland		7,100		None

PORTUGAL

S. A. Concessionaria de Refinacao de Petroleos em Portugal, Rua do Alecrim 57, Portugal	Cabo Ruivo	7,500	S-L-A	None

PUERTO RICO

Note—Puerto Rican Oil Refining Co., Inc., is considering construction of 25,000-bbl.-per-day refinery near Ponce.

ROMANIA

Astra Romana, S. A. 32, Boulevard Regele Carol 1, Bucharest	Ploesti	25,000	Comp.	12,000
Colombia Soc. Franco-Rumanine de Petrol, 10 Rue Romania, Bucharest	Ploesti-Sud	10,000	S-C	5,000
Concordia Soc. An. Rumaine pour l'Industrie due Petrole, Strada Matei Millo, 15, Bucharest	Ploesti-Nord	29,000	S-C	4,200
Creditual Miniere, Soc. An. Rumaine pour le Development de l'Industrie Miniere, Boulevard Bratianu 16, Bucharest	Brazi-Prahova	11,000	Comp.	3,500
Dacia Romano Petroleum Synd., Ltd., 83 Cannon St., E. C. 2, London; Cantacuzino 33, Bucharest	Ploesti-Nord	5,000	S	None
Neo Petrole Fratia	Ploesti-Sud	3,000	S	None

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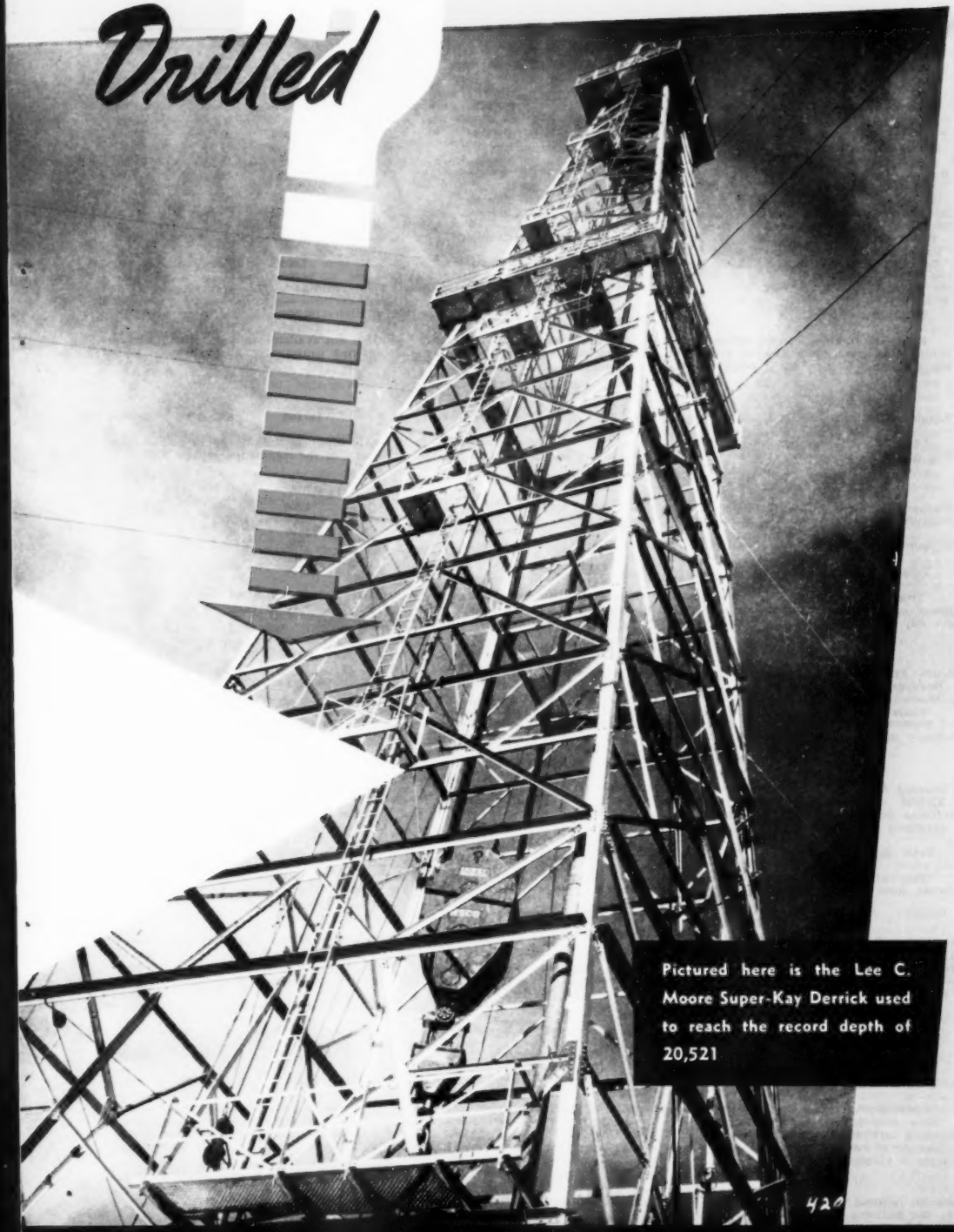

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ROMANIA (Continued)

Company and address—	Plant location	Crude capacity (bbl. dly.)	Type of refinery	Cracking capacity (bbl. dly.)
"Petrol Block" S.A.R., Strada Nicolae Golescu, 7, Bucharest	Ploesti	8,500	S-C	4,000
Petrol Latina S.A.R., Bucharest	Ploesti	3,000	S	None
"Photogen" Rafineria de Petrol, S. A. (Socony-Vacuum) Str. Juli Maniu 104-108, Brasov	Ploesti-Nord	3,500	S	None
Romano-Americana, S. A., 126 Calea Victorei, Bucharest	Teleajen	18,000	S-C-L-A	8,000
"Romano-Belgiana Depetrol" S. A. Strada Biserica Amzei 28, Bucharest	Ploesti	5,000	S	None
Spies Petroleum Co., Ltd., 17 Waterloo Place, S. W. 1, London	Ploesti	5,000	Comp.	6,300
Steaua Romana S. A., pour l'Industrie du Petrole, Blvd. Carol 17, Bucharest	Campini	31,000	S	None
"Unirea" S.A.R. de Petrol (Phoenix Oil & Transport Co., Ltd., London), Casuta Postala, 1, Ploesti	Ploesti	7,000	S-C	
		14,000	S-C	7,000
		3,500	L-A	
Total Romania		181,500		50,000

Note—Information on current status of the refining industry in U.S.S.R.-controlled areas not available through official sources. Information from other sources indicate nationalized Romanian refineries have a combined capacity of approximately 180,000 bbl. daily, much of which is reported not being utilized.

SAUDI ARABIA

Arabian American Oil Co., Dhahran, Saudi Arabia	Ras Tanura	140,000	S-C-A*	20,000

*A 500-bbl.-per-day asphalt plant for the production of roadway construction materials for local uses, is under construction. The plant, which will operate on residuum from a vacuum distillation operation, is scheduled for completion in late 1950.

SCOTLAND

Starhaven Refineries, Ltd., Norman House, Strand, London, W. 1	Ardrossan	*4,300	A	None
Scottish Oils, Ltd., 53 Bothwell St., Glasgow, C. 2	Grangemouth	†14,000	S-C	3,000
	Pumpherston	‡3,700	S-C-W	1,300
William Briggs & Sons, Ltd., East Camperdown St., Dundee	Dundee	700	L-A	None
Total Scotland		22,700		4,300

*Processing reduced crude. †Additional crude-oil capacity being installed for increasing refinery to 35,000 bbl. per day. Refinery operates on imported crude oil. ‡Distillation operations consist of processing 2,500 bbl. daily of shale oil and 1,200 bbl. per day of United Kingdom crude oil. Refinery at Pumpherston produces synthetic detergents.

SOUTH AFRICA

South Africa Torbanite Mining & Refining Co., Ltd., Box 83, Boksburg North, Transvaal	Boksburg North	(*)	C-A	2,000

*Shale-oil retorting operation. The oil obtained from retorting Torbanite (oil shale) is cracked in a conventional thermal unit.

Note—Union Petrol Refinery, Ltd. (Standard-Vacuum), expects to start construction on a new 10,000 to 20,000-bbl.-per-day refinery in late 1949 or early 1950. The refinery is to be located at Durban.

SPAIN

Compania Arrendataria del Monoplio de Petroleos, S. A. Torija, 9, Madrid	Cornella, Barcelona	700	S-L-A	None
Refinera de Petroleos de Escombeeras, S. A., Carrera de San Jeronimo 19, Madrid	Cartegena	5,000	S-C	†5,400
Total Spain		5,700		5,400

*This refinery, now under construction, is scheduled to be in operation early in 1950. By the middle of 1951 additional facilities, now authorized for construction, will increase crude-oil capacity to 20,000 bbl. daily. †Thermal reforming operation.

SWEDEN

A. Johnson & Co., Postbox 52, Nynashamn	Nynashamn	12,000	Comp.	2,900
A. Johnson & Co., Postbox 52, Nynashamn	Malmo	1,800	S-A	None
Koppartranz	Goteborg	12,000	S	None
Svenska, Skifferolje Aktiebolaget, Drottninggatanz, Orebro	Orebro	(*)	S-A	
Total Sweden		25,800		2,900

*Processes shale oil to L.P.G., gasoline, light and heavy fuels, and asphalt.

TURKEY

M. T. A. Enstitusu (Turkish Government), Ankara	Batman	1,400	S	(*)

*Addition of thermal cracking plant to current facilities, contemplated.

Note—Negotiations are under way for erection in Turkey of two new refineries, each of which is to be a complete installation including catalytic cracking and all other facilities. One plant is to have 20,000 bbl. daily crude-oil capacity and is to be located at Iskenderun and the other, a 5,000-bbl. daily refinery, is to be located near Ramaudag oil field. Preliminary work on both refineries is planned for 1950.

UNITED STATES

Data on refining operations in the United States was published in the Refining Number of The Oil and Gas Journal, March 24, 1949. Total capacities on the 374 U. S. operating refineries are		6,515,505		3,752,390

Note—The Oil and Gas Journal's 1950 refinery survey is scheduled to be published March 23, 1950.

U.S.S.R.

Official information on current capacity and status of Russia's refineries is not available. Prewar U.S.S.R. reported 13 refineries rated at 637,500 bbl. daily crude capacity and 178,500 bbl. per day cracking capacity. Approximately 25 refineries having a capacity of 650,000 bbl. per day of crude oil and 250,000 bbl. daily of cracking capacity are believed to be located within U.S.S.R. boundaries. During wartime and in the early postwar period, U.S.S.R. is reported to have moved a number of refineries into its prewar boundaries from various areas in eastern Europe.

URUGUAY

Company and address—	Plant location	Crude capacity (bbl. dly.)	Type of refinery	Cracking capacity (bbl. dly.)
Administration Nacional de Combustibles, Alcohol y Portland, P. O. Box 1090, Montevideo	Lateja	*15,700	S-C	†2,000

*Capacity includes a topping unit and a thermal cracking plant which has been converted to atmospheric distillation operations. When operating the topping unit only the refinery crude-oil capacity is approximately 6,300 bbl. daily. A new 9,500-bbl.-per-day topping unit is now under construction and is scheduled for operation early in 1950. The new unit includes vacuum facilities for processing 50 per cent reduced crude to lubricating-oil base stocks and asphalt. Plans are under way for revamping the existing topping unit and for installing equipment to produce liquefied gas.

VENEZUELA

British Controlled Oilfields, Ltd., San F at Pajaritos No. 15, Caracas	Mene Mauroa	250	S	None
Colon Development Co., Ltd., Mijares a Mercedes 25, Caracas	La Rivera	200	S	None
	El Calvario	200	S	None
	Casigua	1,500	S	None
	La Rivera	200	S	None
Creole Petroleum Corp., 350 Fifth Avenue, New York	Amuay Bay	*60,000	S-A	None
	Caripito	54,000	S-C	24,000
	La Salina	10,000	S-A	None
Mene Grande Oil Co., Apartado 709, Caracas	Cabimas	800	S	None
	Oficina	400	S	None
Shell Caribbean Petroleum Co., Inc., 117 Main Street, Flemington, New Jersey, U.S.A.	San Lorenzo	41,000	S	None
Shell Co. of Venezuela, Ltd.	Punta Cardon	40,000	S-C	8,000
Sinclair Oil & Refining Co., Apt. 1706, Caracas	Puerto de la Cruz	†35,000	S	None
Socony-Vacuum Oil Co., Salas a Caja de Agua 59, Caracas	Guario	120	S	None
Texas Petroleum Co., Tienda Honda a Punte 59, Caracas	Tucupita	10,000	S	None
Total Venezuela		253,670		32,000

*Initial operations of this new refinery are scheduled to start early in 1950. Full operations of the refinery are expected to be attained by the end of 1950. †Operation of this new refinery is not scheduled until late 1950.

Note—Venezuelan Gulf Refining Co. is erecting a 30,000-bbl. per day refinery at Puerto La Cruz.

WALES

National Oil Refineries, Ltd., Britannic House, Finsbury Circus, London, E. C. 2	Llandarcy	*60,000	Comp.†	‡4,000

Includes 40,000-bbl. daily capacity which is scheduled for operation in late 1949. †Lubricating-oil manufacturing facilities to be increased by 1952. ‡Capacity does not include 9,000-bbl. daily thermal reforming unit now under construction.

WEST INDIES

Aruba

Lago Oil & Transport Co., Ltd., Aruba	Aruba	350,000	S-C-A	*228,000
Arend Petroleum Mij., Willemstad, Oranjestad, Aruba	Oranjestad	27,000	S-C	†3,000
Total Aruba		417,000		231,000

*Includes 28,000-bbl. daily capacity of catalytic cracking. †Operating to process 8,000 bbl. per day of crude oil.

Curacao

N. V. Curacaosche Petroleum Industrie Mij., Carl van Byjlandtlaan 30, The Hague	Emmastad	200,000	S-C-L-A	*280,000

*Currently operating in distillation service.

Trinidad

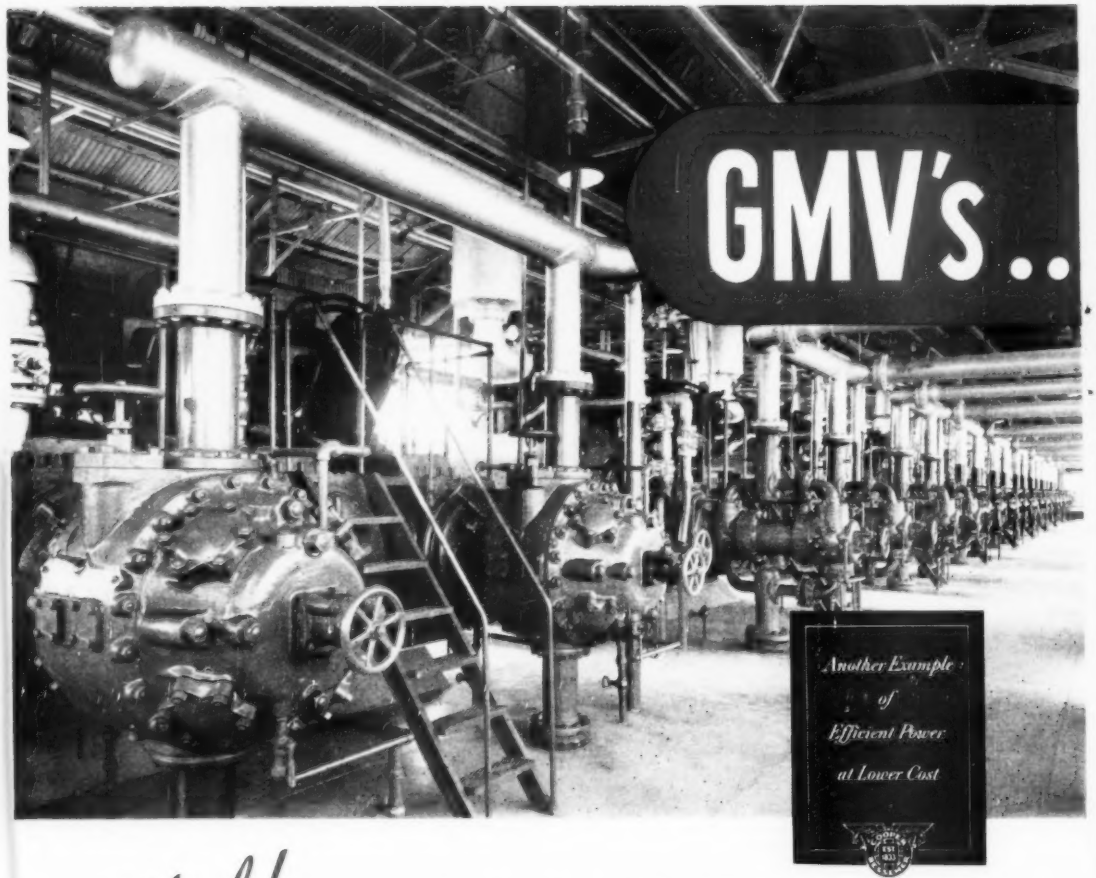
Kern Trinidad Oilfields, Ltd., 36-38 Kingway, London, W. C. 2	Guapo	1,000	S	None
Trinidad Leaseholds, Ltd., Trinidad House, 29/30 Old Burlington St., London, W. 1, England	Pointe-a-Pierre	70,000	Comp.	*45,000
Trinidad Lake Asphalt Operating Co., Ltd. (General Asphalt subsidiary), Barber, N. J.; Philadelphia	Brighton	1,000	S-A	None
Trinidad Oilfields Operating Co., Ltd., Port-of-Spain	La Brea	1,300	S	None
United British Oilfields of Trinidad, Ltd., 15 Abercromby St., Port-of-Spain, Trinidad, B.W.I.	Point Fortin	31,000	S-A†	None
Total Trinidad		104,300		45,000

*Includes 20,000-bbl.-per-day reforming capacity 50 per cent of which is shut down. †Continuous-blowing asphalt equipment, having capacity of 3,500 bbl. daily nearing completion.

YUGOSLAVIA*

Ivanovic & Co., Belgrade	Osijek	550	S	None
Raffineria di Olii Minerili (A.G.I.P.), Fiume	Fiume	2,500	S-L-W	None
Shell Oil Co. of Jugoslavia, Ltd., Zagreb	Sisak (Caprag)	2,000	S	None
Standard-Vacuum Oil Co. of Yugoslavia, Inc., Zagreb	Brod	2,250	S	None
Sumadiska Kreditava, Belgrade	Smedrevo	1,000	S	None
Total Yugoslavia		8,300		None

*Information on refinery operations in Yugoslavia as in other U.S.S.R.-controlled regions is not available from official sources. Estimates indicate refining capacity in Yugoslavia is approximately 8,500 bbl. per day.



World Premier...

Eleven years ago, the first three Cooper-Bessemer GMV's ever built were installed in the Royalite Oil Company's Compressor Station No. 1 at Turner Valley, Alberta, Canada. Shown above as it is today, the station now contains ten GMV's. Elsewhere, as in this plant, familiarity with GMV performance has led to more and more of these units as needs grew . . . has led also to the widespread use of GMV's wherever large scale compressor service is involved. Thus the popularity of these efficient, long-lived V-angles has multiplied through the years. It speaks for itself.

V ANGLE

Compressors

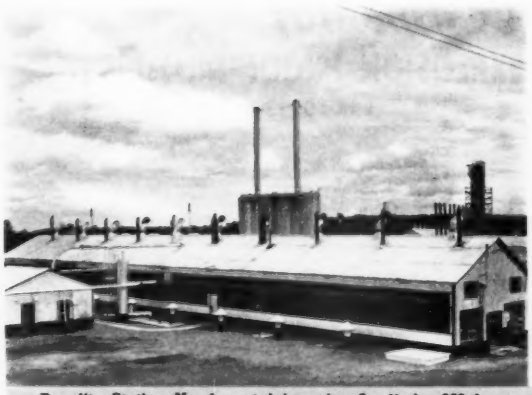
New York Washington Bradford, Pa. Parkersburg, W. Va. San Francisco, Cal. Seattle, Wash.

..11-year choice at Royalite Oil

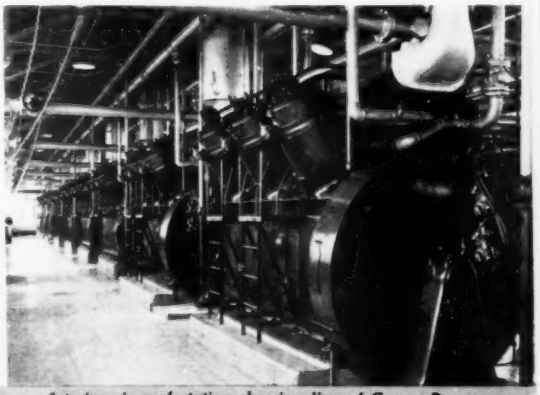
ROYALITE Oil Company's three 11-year-old GMV's, the first ever built, are still in continuous service: have held up so well that visitors can't tell them from the seven since added to this company's No. 1 station as needs grew. Royalite's other two stations are likewise equipped with Cooper-Bessemer V-angles, Type GMV and the smaller GMX. The most recent addition to station No. 1* is a GMV *Turboflow*, installed this past summer. It gives Royalite unprecedented advantages—a full 10% increase in power output compared with other units of equal displacement, plus at least a 15% reduction in fuel consumption.

If your plans call for compressor horsepower, bear in mind that Cooper-Bessemer Turboflow V-angles, GMX, GMV and GMW, are now available in sizes from 200 to 2500 hp. Check on the savings you can show!

** Station No. 1 is now owned by Madison Natural Gas Company, Ltd., a totally owned Royalite subsidiary.*



Royalite Station No. 1 containing nine 6-cylinder 600 hp GMV's and a 6-cylinder 660 hp GMV Turboflow, for a total 6,060 compressor horsepower.



Interior view of station showing line of Cooper-Bessemer GMV-6 compressors from crank-door side. Compressor side of line shown on opposite page.

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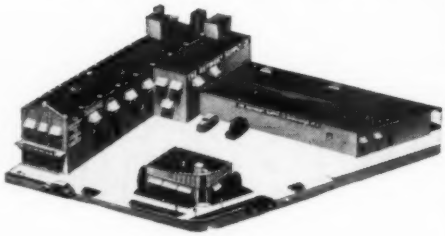

- Ac-Me Recording Gravitometer
- Ac-Me Specific Gravity Gas Balance
- Ac-Me Pressure Vacuum Pump
- R. S. Portable Vacuum Pump
- R. S. Mercury Cleaner
- R. S. Manometer
- R. S. Dead Weight Gauge
- R. S. Dead Weight Tester
- R. S. Orifice Well Tester
- R. S. Moisture Tester
- R. S. Flat Bore Yel-O-Bak Thermometers
- R. S. Streamlined Hydrometers
- R. S. Pulsometer
- R. S. Pressure Hydrometer Jars
- R. S. Vapor Pressure Bomb
- R. S. Diamond Core Drill
- R. S. Thermo Plumb Bob Thermometers
- R. S. Thermostat Temperature Controls
- R. S. High Pressure Consistometer
- R. S. Smoke Meters

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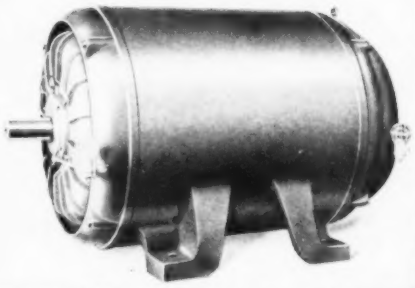

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ELECTRIC MOTORS

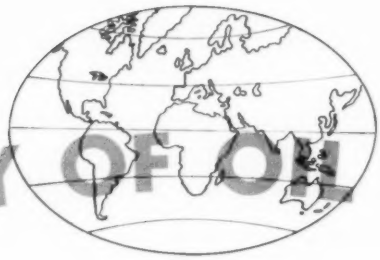
Summary of International Petroleum

Compiled From Data Presented in the Following 16-Page Annual Survey

Country (by areas)—	No. of producing wells: Flowing	No. of producing wells: Pumping	Producing depths: Shallowest (ft.)	Producing depths: Deepest (ft.)	Daily avg. prod. (bbl.)	Accumulated prod. 7-1-49 (1,000 bbl.)	Wells drilling	Gravity, A.P.I.°
Alaska	1			2,505	§145,000			
Argentina†								
Bolivia	81	23	2,190	3,190	2,160	4,527	3	26-53
Brazil	24	58	840	2,910	555	588		22-43
Canada	953	2,017	500	9,150	54,859	146,673	72	14-40
Chile	12			7,500	Shut in	Shut in	3	40
Colombia	127	1,051	200	10,876	91,650	452,940	20	19.5-46.2
Cuba†								
Ecuador	42	3,498	747	1,717	7,012	485	2	37-40
Mexico	924	159	429	8,578	159,524	2,400,673	29	12-36
Peru	309	2,883	500	7,000	40,800	310,767	33	29-44
Trinidad			100	10,000	56,450			18-31
Venezuela	4,055	5,213	754	13,451	1,313,200	4,692,083	131	10-53
Total W. Hemisphere (excl. U. S.)	6,528	14,902	100	13,451	1,726,210	8,008,736	293	10-53
Albania*								
Algeria		2		850	14	1	1	35
Austria	12	562	400	8,500	18,200	57,352	10	13-48
Czechoslovakia*								
Egypt	28	90	400	3,870	42,500	128,478	4	19-26
England (incl. Scotland)		243	85	2,500	954	4,298	1	28-40
France	12	665	170	5,000	1,115	184,402	4	30-32
French Morocco	9	19	500	3,165	303	336	4	34-45
Germany	(†)	(†)	(†)	(†)	17,312	(†)	(†)	(†)
Hungary	98	62	(*)	(*)	(*)	41,456	(*)	(*)
Italy		222	500	2,400	188	(†)		31-50
Netherlands		79		2,500	11,790	7,505	8	24.8
Poland*								
Romania	(*)	(*)	(*)	(*)	89,000	(*)	(*)	(*)
Yugoslavia	(*)	(*)	4,000	4,200	(*)	(*)	(*)	(*)
Total Europe and North Africa	159	1,944	85	8,500	181,362	423,828	32	13-50
Bahrein Island	68		2,000	2,200	30,000	104,377	2	33.5
Iran	72		2,000	9,000	570,000	2,057,800	8	33-43
Iraq	18		840	5,500	75,000	402,000	9	16-36
Kuwait	61		4,000	4,750	226,000	113,984	12	31.8
Qatar	7			6,000	Shut in	Shut in	2	36
Saudi Arabia	97		4,800	10,670	479,000	437,107	5	31-38
Turkey		4		4,400	3,000	46,000	3	20
Subtotal Middle East	323	4	840	10,670	1,383,000	3,161,268	41	16-43
Burma*								
China*								
India	483	242	500	5,000	5,200	42,000	6	36
Japan	(†)	(†)	300	5,000	3,800	(†)	(†)	17-40
Pakistan	7		5,200	8,200	1,800	(†)	(†)	22-37
East Indies‡:								
Borneo	130	751	195	6,900	87,930	583,795	12	14-40
Ceram			240	920	Shut in	8,203		23
Java	4	55	320	6,000	1,400	120,280		24-40
New Guinea	5	10	300	3,225	6,000	984	3	19-48
Sumatra	634	5	100	5,400	97,900	601,755	12	22-64
Subtotal Far East	1,263	1,063	100	6,900	204,030	1,357,017	33	14-64
Total E. Hemisphere (excl. Russia and Baltic countries)	1,745	3,011	85	10,670	1,768,392	4,942,113	106	13-64
Grand total	8,273	17,913	85	13,451	3,494,602	12,950,849	399	10-64

*Data unavailable due to unsettled political conditions. †Complete data unavailable. ‡Variable conditions. Some areas still inaccessible for rehabilitatio n work account unsettled political conditions. §Cubic feet of gas.

Journal's



International

SURVEY OF OIL FIELDS

Alaska

OPERATIONS are confined to 35,000-sq. mile U. S. Naval Petroleum Reserve No. 4 in Arctic area where exploration work started in 1944. One test has been completed as gas well near Point Barrow in 1948 and gas has been made available at operating camp there. Additional exploration activities are scheduled for 1950. Arctic Contractors, with headquarters at Fairbanks, are in charge of operations under direction of the Navy.

ALASKA

Name of field—	Year of discovery	No. of producing wells: Flowing	Pumping	Producing depth	Daily avg. production (bbl.)	Accumulated production to 7-1-49 (bbl.)	Wells drilling	Name and type of formation	Gravity A.P.I.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Point Barrow	1949	1 (gas)		2,505	145,000 cu. ft.			Jurassic sand	

Albania

THERE is little definite information on the Albanian oil industry which in 1948 reportedly produced some 360,000 bbl. As in other Iron Curtain countries, the industry is nationalized. Albania in June began shipping small amounts of asphalt oil to Poland under a trade agreement. There is a small refinery in the fields, and a pipe line to Valona. The two oil-producing areas are Devoli and Pahtosa.

Algeria

SOME minor successes have been reported in the exploratory drilling being carried out in Algeria. Wildcats near Aumale and at Oued Gueterini tested for small quantities of oil. The work is being conducted by Soc. Naticnale de Recherches et d'Exploitation de Petrole en Algerie, in which the French and Algerian governments are interested. The company's head office is at 34, Boulevard Saint-Saens, Alger, and its Paris office is at 42, Rue La Boetie, Paris (8eme).

ALGERIA

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Qued Gueterini	1949		2	850	14	555	1	Miocene	35

Argentina

ABOUT two-thirds of the approximately 61,000 bbl. daily being produced in Argentina is by the government's oil agency, Yacimientos Petroliferos Fiscales. Practically all the exploratory work being done is by this organization. Since the spring of 1948, Argentina has classified oil-production statistics as a state secret. Best information indicates about 45 rigs are running. Y.P.F. last summer reported one new field discovery in the Tierro del Fuego region across the border from the Chilean oil developments. Further development of this Argentine area is scheduled. The major operating companies are: Y.P.F., Avenida Presidente Roque Saenz Pena 777, Buenos Aires (New York office, 80 Broad Street); Standard Oil Co., S.A., Argentina, Avenida Presidente Roque Saenz Pena 567, Buenos Aires; Cia. de Petroleo, Edificio Shell-Mex, Avenida Presidente Roque Saenz Pena 788, Buenos Aires; Cia. Astra de Petroleo, Avenida Alem 621 (R.I.), Buenos Aires. The following report summarizes Shell and Standard operations. No official information is available on Y.P.F.

ARGENTINA

Official information covering 1949 operations of Yacimientos Petroliferos Fiscales, principal oil-producing company and owned by the government, not available. Following tables summarize operations of the Standard Oil Co. of Argentina, S.A., and of "Diadema Argentina," S.A. de Petroleo (Shell).

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(Shell):									
Comodoro Rivadavia-K27	1925		428	3,400	10,000	69,101,185	2	Upper Cret. sands	24
(Standard):									
Agua Blanca	1926		3	2,300-3,600	65	1,317,061		Tarija, Permian	22
Cerro Tartagal	1927	1	2	2,300-3,600	25	109,948		Tarija, Permian	45
Lomitas	1927	6	29	700-3,300	180	3,461,056		Tarija, Permian	43
Ramos	1928		2	3,770-3,930	15	74,675		Devonian	53
San Pedro	1928	4	19	1,800-3,300	970	14,767,403	1	Tupambi, Permian	30-44
Dadin	1924	5	37	1,640-3,300	270	8,106,360		Lotena, Jurassic	33
Huincul	1923	7	36	2,600	480	4,776,465		Lotena, Jurassic	33
Subtotal		23	128		2,005	32,612,968	1		

Austria

SOME 60 per cent of Austria's oil production and five of its eight refineries will continue under control of Russia's Soviet Mineral Oil Administration as a result of the Austrian treaty now being negotiated. In addition, Russia will gain exploration rights over the Vienna basin which includes practically all the proven and prospective areas. Outside some minor Austrian interests, the non-Russian companies are represented by R. K. Van Sickle Co. and Rohoelgewinnungs, A.G. The Van Sickle interests are handled by a trustee in Vienna. Socony-Vacuum Oil Co., Inc., and Shell share ownership of Rohoelgewinnungs (Rag) with Socony-Vacuum in charge of management. Rag's Austrian address is Schwarzenbergplatz 5, Vienna 1, its American address, 26 Broadway, New York. The Soviet Mineral Oil Administration is located at Kantgasse 1, Vienna 1.

AUSTRIA*

Name of field—	Year of discovery	No. of producing wells: Flowing	No. of producing wells: Pumping	Producing depth	Daily avg. production (bbl.)	Accumulated production to 7-1-49 (bbl.)	Wells drilling	Name and type of formation	Gravity °A.P.I.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
St. Ulrich-Hauskirchen	1938		320	2,700-3,800	5,600	20,800,000		Miocene sand	31°
Maustrenk	1941		32	2,700-3,300	600	1,350,000		Miocene sand	26°
Muhlberg	1942	8	17	1,500-5,300	4,850	5,200,000	3	Miocene sand	30°
Matzen	1948	4		5,000	1,200	500,000	6	Miocene sand	27°
R. K. van Sickle	1939		42	1,300-4,600	600	6,140,000		Miocene sand	21°-27°
Gosting	1932		50 (zone top)	1,968	1,650			Miocene sand	20°-27°
Rag	1930		36 (zone top)	2,230	940	11,745,000		Miocene sand	20°-27°
Gaiselberg	1938		60	2,100-7,800	2,730	11,500,000	1	Miocene sand	22°-27°
Hohenruppersdorf	1941		5	3,300-5,400	30	90,000		Miocene sand	35°
Aderklaa†	1942			8,000-8,500		25,000		Miocene sand	48°
Leoprechting†				400-500		2,000		Miocene sand	13°
Total Austria		12	562		18,200	57,352,000	10		

*Russian controlled, number of wells and production estimated. †Depleted.

Bahrein Island

OIL production on Bahrein Island, off the coast of Saudi Arabia in the Persian Gulf, appears to have settled down at the daily rate of about 30,000 bbl. Earlier this year preparations were being made for exploration in the submerged offshore areas. The operating company is Bahrein Petroleum Co., Ltd. (Standard Oil Co. of California and The Texas Co.) with main offices at 551 Fifth Avenue, New York 17, and field headquarters addressed at Bahrein Island, Persian Gulf.

BAHREIN ISLAND

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Bahrein	1932	68		2,000-2,200	30,000	104,377,597	2	Cretaceous limestone	33.5°

Bolivia

OPERATIONS in Bolivia are by the state-controlled Yacimientos Petroliferos Fiscales Bolivanos with offices in La Paz. The agency is continuing a modest program of developmental drilling and this fall was to commence preliminary mapping and geological work in the Banos de Izozog region. Similar work is scheduled in the Caupolican and Iturralde areas. The agency has arranged for a $3,300,000 credit with a New York bank to complete its refinery construction program. The United States' representative of Y.P.F.B. is at 707 Tower Building in Washington.

BOLIVIA

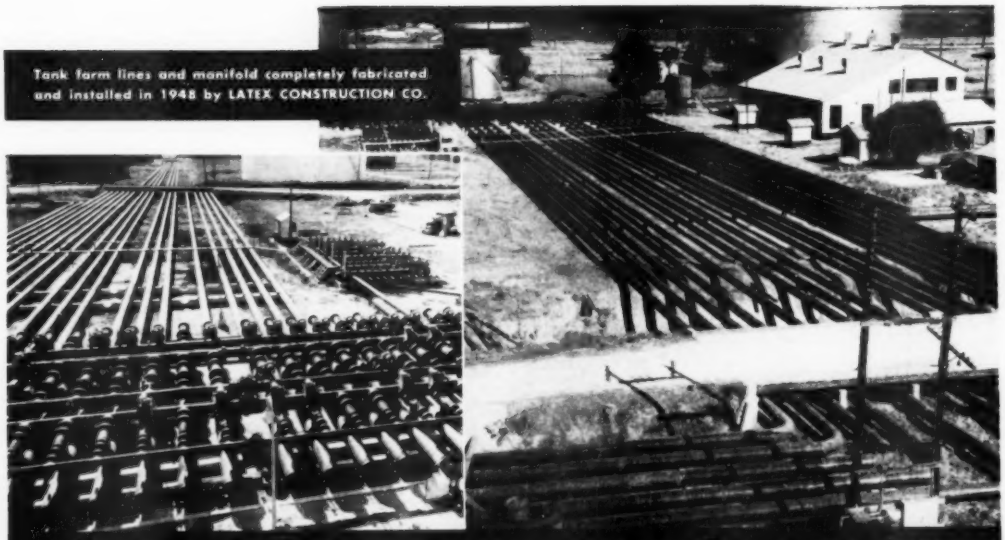
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Bermejo	1922	1	6	3,190	220	837,000		Permo-Triassic	26°
Camiri	1927	11	3	3,010	1,720	2,034,000	3	Devonian	53°
Sanadita	1926	1	14	2,190	220	1,656,000		Permo-Triassic	42°
Total Bolivia		81	23		2,160	4,527,000	3		

Brazil

WORK is continuing in Brazil on the 2,500-bbl. daily refinery which will provide the first important commercial use for production which has been built up in the State of Bahia around All Saints' Bay. Much of the production, estimated up to 5,000 bbl. daily, has been shut in for lack of an outlet. Conselho Nacional do Petroleo, the Brazilian Government agency which carries out oil development, has during the year completed several wildcats in various localities and is continuing exploration work, though hampered by the dollar shortage. The conselho is at Av. Presidente Wilson, 164, Rio de Janeiro.

BRAZIL

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Candeias	1941	15	34	2,910	500	397,000		Cretaceous (Santo Amaro)	22°-36°
Lobato	1939		4	1,300	30	69,260		Cretaceous (Santo Amaro)	27°-36°
D. Joao	1947	2	9	840		14,448		Cretaceous (Santo Amaro e Sergi)	34°-39°
Itaparica	1942	7	8	2,000	Shut in	51,796		Cretaceous (Santo Amaro e Sergi)	27°-42°
Aratu	1942		3	1,470	25	55,338		Cretaceous (Santo Amaro)	43°
Total Brazil		24	58		555	587,842			



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DISTRIBUTORS IN PRINCIPAL CITIES

Burma

CIVIL strife in Burma since the end of the war has prevented reconstruction of the industry, and operations are at a reduced level pending more normal conditions. At the end of the summer about 500 bbl. daily was being processed by Burmah Oil Co., Ltd., in its improvised refinery at Chauk, and some shipments were reaching Mandalay under armed government escort. Little field work was being done. Also complicating the situation for private companies were the plans of the Burmese Government to acquire a share of the industry. Principal operator is Burmah Oil with offices at Britannic House, Finsbury Circus, London, E.C. 2. Other companies are British Burmah Petroleum Co., Ltd., Bilbao House, 36, New Broad Street, London, E.C.2, and Indo-Burma Petroleum Co., Ltd., 24-28, Lombard Street, London, E.C. 2.

BURMA

Name of field	Year of discovery	No. of producing wells: Flowing	No. of producing wells: Pumping	Producing depth	Daily avg. production (bbl.)	Accumulated production to 7-1-49 (bbl.)	Wells drilling	Name and type of formation	Gravity °A.P.I.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
North Basin:									
Indaw	1918	(*)		1,100	(*)			Miocene sand	36
Central Basin:									
Sabe	1908	(*)		100-1,800	(*)			Oligocene sand	36
Yenangyat	1893	(*)		400-4,200	(*)			Oligocene sand	36
Lanya	1919	(*)		2,000-5,000	(*)			Oligocene sand	36
Singu (Chauk)	1902	(*)		2,500-5,000	(*)			Oligocene sand	36
Yenagyaung	1889	(*)		350-5,000	(*)			Miocene-Oligocene	36
Minbu		(*)		450-700	(*)			Miocene-Oligocene	36
Palanyou	1910	(*)		2,300	(*)			Miocene-Oligocene	36
Yethaya		(*)			(*)			Miocene-Oligocene	36
South Basin:									
Yenamma	1922	(*)		600-1,700	(*)			Oligocene sand	36
Padaukpin	1922	(*)			(*)				
Pyaye	1928	(*)			(*)				
Total Burma		(*)			(*)				

*Due to unsettled conditions, no data available.

Canada

THE oil discoveries in Western Canada have been one of the most spectacular and important developments in the industry since the end of the war. It began with the Leduc discovery by Imperial Oil, Ltd., in February 1947. Virtually all the larger American oil companies have entered the play. Completion of the Imperial-sponsored pipe line to Superior, Wis., late in 1950, will give Alberta oil its first outlet to major markets. Potential of the Western Canada area is now estimated at more than 100,000 bbl. daily, with production only slightly more than half that figure pending completion of the pipe line. About 90 per cent of the development is on Crown lands. Several Canadian and American oil companies have their operating headquarters at Calgary.

CANADA

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Conrad	1944		17	3,200	460	848,608		Jurassic ss., Ellis	25
Leduc:									
D3	1947	223		5,300					38 -40
D2	1947	86	10	5,100	26,050	9,717,142	26	Upper Devonian dolomite	38 -40
Cretaceous	1948	6	3	4,200					37 -39
Lloydminster	1939		234	1,920	4,070	2,007,520		Lower Cret. ss.	14 -17
Princess:									
Devonian	1944	4		3,985					
Madison	1945	4	9	3,300	120	432,163		Upper Devonian, Mississippian	27
Redwater	1948	164	50	3,100	11,000	1,572,717	39	U. Devonian limestone	35
Taber	1942		20	3,200	480	1,128,219		Lower Cret. ss.	23
Turner Valley:									
Shallow	1914		1	3,100					
Limestone	1924	394		9,150	10,700	93,498,625	2	Rundle, Miss. ls.	43
Vermilion	1939		53	1,850	280	1,146,060		Lower Cret. ss.	14 -15
Wainwright	1923		8	2,250	40	283,091		Lower Cret. ss.	18
Others (Alta.)*		12	12	Various	350	548,300		Various	
Norman Wells	1920	60		1,050-1,900	605	2,947,020		Ft. Creek, Dev. ls.	39
Stony Creek, N. B.	1910			1,000-3,200	54	643,300		Albert, Miss. ss.	37
Ontario	1859		1,600	500-3,000	650	30,500,000	5	Dev., Ord. and Sil.	26 -39
Total Canada		953	2,017		54,859	146,672,765	72		

*Includes Golden Spike; Stettler; Whitemud; Bon Accord; Joseph Lake; Barrhead; Pincher Creek; Jumping Pound, et al.

Chile

OIL operations in Chile are carried out by the government organization, Corporacion de Fomento. It has headquarters in Santiago, and its New York offices are at 37 Wall Street. Development drilling and some exploratory work has been carried out for the last 4 years in the Punta Arenas area of the Tierro del Fuego. A pipe line, 8 in. in diameter and 50 miles in length, is nearing completion to give the area a commercial outlet. The wells are shut in, and estimates of the potential range around 3,500 bbl. daily.

CHILE

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Manantiales	1945	12		7,500	Shut in	Shut in	3	Springhill sand-Cretaceous	40

China

CHINA'S oil production located in Kansu Province in the northwest part of the country has fallen into the hands of the Communists. Production, carried out by the Nationalist Government's Chinese Petroleum Corp., amounts to only about 1,000 bbl. daily but it is of importance in meeting the requirements of that part of China. In addition to Yumen field, about 50 bbl. daily is produced in Formosa.

Colombia

PRODUCTION in Colombia continues at a high level from existing fields but several companies have discontinued their exploration efforts in the country. These withdrawals have resulted from a confused legal and political situation and from a discouraging wildcatting record. The producing companies are: Tropical Oil Co., Edificio Colombiana de Seguros, Calle 17, Con Carrera 7, Bogota, whose De Mares concession will revert to the government in August 1951; Cia. de Petroleo Shell de Colombia, Edificio Virrey Solis, Carrera 9, 11-45, Bogota, with a materials organization and warehouse at Barranquilla; Colombian Petroleum Co. (Socony-Vacuum Oil Co., Inc. and The Texas Co.), Cucuta; Cia. del Valley del Magdalena (Socony-Vacuum), Edificio Virrey Solis, Carrera 9, 11-45, Bogota; and Texas Petroleum Co of Colombia, Carrera 8, 12-59, Bogota.

COLOMBIA

Name of field—	Year of discovery	No. of producing wells: Flowing	No. of producing wells: Pumping	Producing depth	Daily avg. production (bbl.)	Accumulated production to 7-1-49 (bbl.)	Wells drilling	Name and type of formation	Gravity °A.P.I.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
De Mares Concession:									
Infantas	1915	3	285	300-2,600	7,500	150,913,917		Oligocene-Eocene	26.4°
La Cina	1926	4	680	200-4,300	25,000	231,003,424		Oligocene-Eocene	24.3°
Colorado	1930	3	2	3,400-4,200	250	281,621		Eocene	38°
Galan	1945		3	3,900-4,050	100	133,851		Oligocene	19.5°
Barco Concession:									
Petrolea	1933	32	2	99-1,953	5,000	29,665,246		La Luna; Cogolio; Uribante; Cretaceous	46.2°
Tibu	1940	58	18	4,300-10,876	21,600	19,679,849	9	Barco-Catatumba, Cogollo; Urib.; Eocene-Cret.	32.5°-46.2°
Rio de Oro	1937	9		1,865	Shut in	66,742		Catatumbo; Urib.; Juan Cret.	39°
Carbonera	1939		2	3,359	250	90,498		Barco; Los Cuervos; Eocene	21°
El Dificil	1943	10		5,500-5,843	4,200	1,592,080	1	El Dificil-Oligocene	42.1°
Cantagallo	1942	2	1	5,400-6,500	750	688,192	1	La Paz-Eocene	21.3°
Casabe	1941	5	58	2,500-3,800	26,000	18,699,522	9	Colorado-Oligocene	20.9°
Velasquez	1946	1		6,700-8,455	1,000	124,500		Guaduas-Eocene	26.3°
Total Colombia		127	1,051		91,650	452,939,742	20		

Cuba

CUBA'S relatively small production of 500-600 bbl. daily is in the hands of national companies, but several major companies hold large blocks of exploration acreage, and in August Gulf Oil Corp. spudded in the first deep test to be drilled in the country in 2 years. The Gulf wildcat, located about 2 miles offshore in Cardenas Bay on the north coast, is the latest major exploration effort in more than 40 years of intermittent attempts to develop more sizable production in Cuba. Shell, Standard Oil Co. (N.J.), and Atlantic Refining Co. also hold acreage in the country.

CUBA

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Jarahueca	1943			1,500					45
Montembo	1880			600-1,800				Eocene ss.	20
Total Cuba									

Czechoslovakia

THE oil industry in Czechoslovakia was nationalized after the country fell into the Russian orbit. Production and refining were placed under a state company, Moravske Naftove Zavody, Narodni Podnik, Hodonin. This organization is supervised by the Central Direction of the Czechoslovakian Mining Industry. Little is known of the exploratory effort, though the production is of minor importance.

CZECHOSLOVAKIA

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Gbley	1913			500-800				Miocene	
Hodonin								Miocene	
Total Czechoslovakia									

*Communist dominated, no current data available.

East Indies

DESPITE political turmoil which has limited access to some areas, particularly North Sumatra and parts of Java, oil companies in Indonesia have carried out restoration of their properties over the last 4 years and established operations on a basis equal to or in excess of prewar. In Indonesia, Australian New Guinea, and British North Borneo, there are six operating companies representing American, British, Australian, and Dutch

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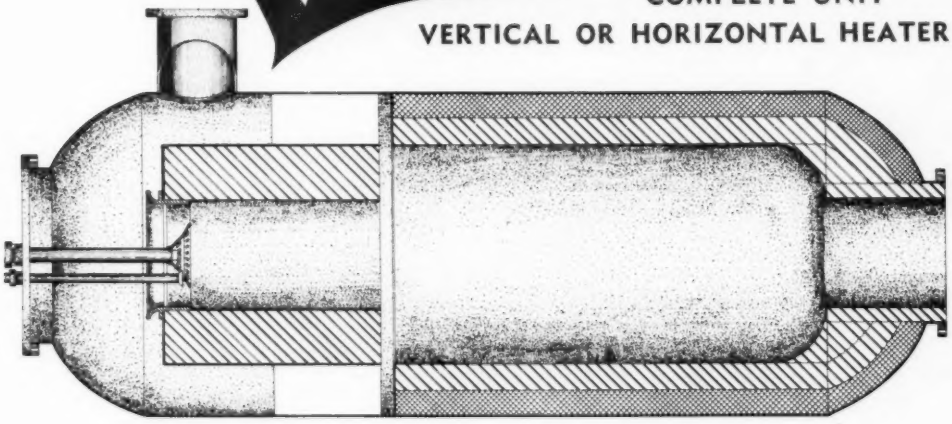

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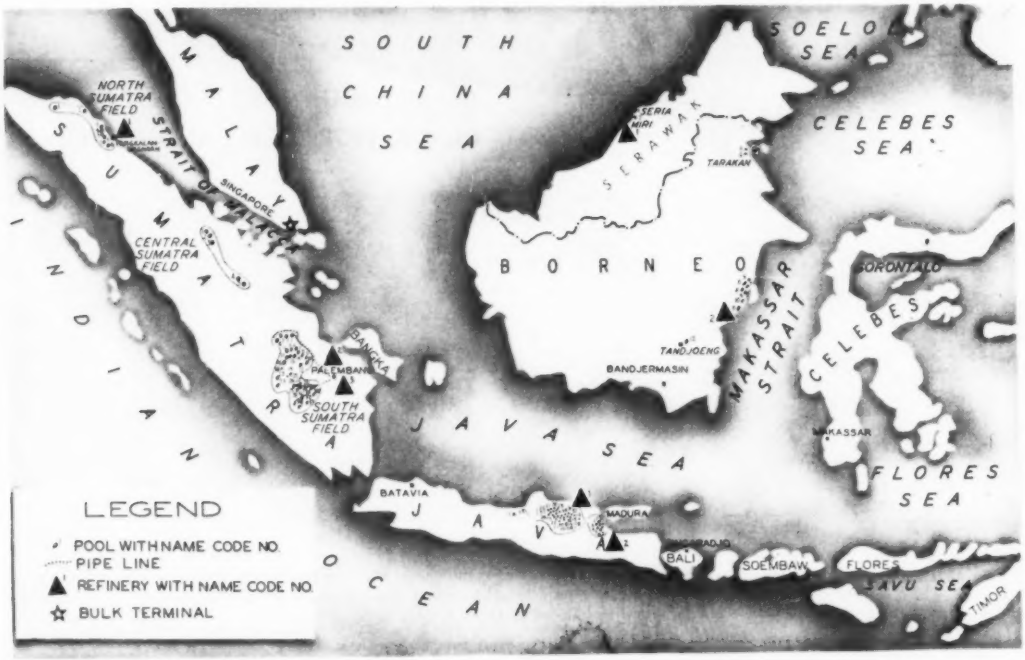
East Indies (Continued)

interests. One of these, Nederlandsche Pacific Petroleum Mij., (California-Texas Oil Co., Ltd.) headquartered in Batavia, is conducting exploration but has no production thus far. Australasian Petroleum Co. (Anglo-Iranian Oil Co., Ltd., Standard-Vacuum Oil Co., and Oil Search, Ltd.) is exploring eastern New Guinea. It has field offices at Port Moresby, and main offices at Melbourne. Nederlandsche Nieuw Guinee Petroleum Mij. (Shell, Standard-Vacuum, Standard Oil Co. of California, and The Texas Co.) opened Klamono field in western New Guinea to production late in 1948. Sarawak Oilfields, Ltd., at Seria, is the operating company for the British North Borneo fields. Through British Malayan Petroleum Co., Ltd., it is a Shell subsidiary. The two other producing companies in Indonesia are N. V. Standard-Vacuum Petroleum Mij., with field offices at Soengi Gerong, Sumatra, and N. V. de Bataafsche Petroleum Mij. (Shell) which has field operations offices in Tjepu, Java; Balikpapan, Borneo, and Pladju, South Sumatra.

EAST INDIES

Name of field—	Year of discovery	No. of producing wells: Flowing	No. of producing wells: Pumping	Producing depth	Daily avg. production (bbl.)	Accumulated production to 7-1-49 (bbl.)	Wells drilling	Name and type of formation	Gravity A.P.I.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Borneo:									
Miri-Sarawak	1911		104	300-3,050	1,000	71,021,000	1	Tertiary	21°-35°
Seria-Brunei	1929	115	33	1,600-6,900	70,000	93,754,000	3	Tertiary	19°-33°
Northeast District:									
Tarakan	1906	5	426	195-2,400	7,900	159,883,000	2	Pliocene	20°
Boenjoe	1930	6 (shut in)		1,970-3,100	Shut in	369,000	2	Pliocene	24°-40°



OIL POOLS

NORTH SUMATRA FIELDS

No.	Field
1	Pase
2	Perlak
3	Rantau
4	Serongdiaia
5	Pangkalansusu
6	Paluh Tabuan
7	Telaga Said
8	Darat

CENTRAL SUMATRA FIELDS

No.	Field
1	Duri
2	Sebanga
3	Minas
4	Ukui
5	Lirik

SOUTH SUMATRA FIELDS

No.	Field
1	Kenali Asam
2	Badjubang
3	Tempino
4	Betung
5	West Berau
6	Berau
7	Kali Berau
8	Kenawang
9	Gresik
10	Bentajan
11	Kerkai
12	Selara
13	Lodangpait
14	Sumpal
15	Sungei Lilin
16	Lubuk Batu
17	Kluang
18	Suban Burung
19	Babat
20	Manqundjaia
21	Karang Ringin
22	Mambang
23	Musi
24	Djirak
25	Benakat
26	Selo
27	Talang Akar
28	Radjc
29	Gunung Kemula
30	Tal Djimar
31	Limau
32	Tandjung Miring
33	Kliat
34	Muaraenim Group

BORNEO FIELDS

No.	Field
1	Seria
2	Miri
3	Diugta
4	Pamusian
5	Semberah
6	Ulu K. Mumus
7	Angana
8	Pelafang
9	Samga Sanga
10	Sambodja
11	Balikpapan
12	Tandjung

JAVA FIELDS

No.	Field
1	Metatu
2	Made
3	12 Desas
4	Lidch Kulon
5	Gunungsari
6	Kruka
7	Petiken
8	Kedewan (Dandongilo)
9	Wonotjolo
10	Kawengan
11	Wonosari
12	Kidangan
13	Ledok
14	Kedinding
15	Nglobo
16	Semanggi
17	Banjuasin
18	Metes
19	Gliran
20	Petak
21	Lusi
22	Trembes
23	Tungkul
24	Bapo
25	Trembul
26	Tjandi
27	Ngiono
28	Plantungan-Kalipiting
29	Banjubang
30	Gegunung
31	Ngraiung
32	Sebogo
33	Klantung Sodiomerto

REFINERIES

SUMATRA

No.	Name
1	Pang Kalanbranan
2	Pladiu
3	Sungei Gerong

BORNEO

No.	Name
1	Lutong
2	Balikpapan

JAVA

No.	Name
1	Tjepu
2	Wonokroma

EAST INDIES (Continued)

Daily avg. production (bbl.) (1)	Accumulated production to 7-1-49 (bbl.)	Wells drilling (2)	Name and type of formation (3) (4)	Gravity A.P.I. (5)	Name of field (6)	(7)	Year of discovery (8)	No. of producing wells: Flowing (9)	Pumping (9)	Producing depth (10)
Samarinda District:										
Anggana-Moeara		1902	1 78	380-3,200	4,230	61,142,000	1	Miocene		19[a]-33[a]
Sambodja		1910	1 38	160-4,400	1,200	53,293,000		Miocene		14[a]-34[a]
Sangatta		1940	1 (shut in)	1,640-4,200	Shut in	None	1	Miocene		36[a]
Sanga Sanga		1897	72	430-2,900	3,320	143,938,000		Miocene		18[a]-36[a]
Southern District:										
Tandjoeng		1938	1	2,500-4,309	280	383,000	2	Eocene		40[a]
Total Borneo			130 751		87,930	583,795,000	12			
Ceram:										
Boela-Lemoen		1897	Shut in (*)	240-920	Shut in*	8,203,000		Triassic-Pliocene		23[a]
*No attempt at postwar rehabilitation.										
Java:										
Rembang District:										
Kawengan		1926	(*)	1,750-2,700	(*)	38,972,000		Miocene sandy lime		34[a]
Ledok		1896	(*)	320-3,200	(*)	21,125,000		Miocene		43[a]
Nglobo-Semanggi-Banjoeasin		1897	(*)	370-3,550	(*)	18,044,000		Miocene sandy lime		43[a]
Sourabaya District:										
Kroeka		1929	4 55	970-1,600	1,400	7,119,000		Miocene		30[a]
Linda-Koelon		1896		490-1,330	Shut in	33,369,000		Miocene lime		24[a]
U. S. Co. fields:										
Loesi		1932	(*)	Ave. 2,300	(*)	505,000		Tertiary		40[a]
Ngliron		1940		Ave. 6,000	(*)	10,000		Tertiary		40[a]
Petak		1914	(*)	Ave. 2,300	(*)	781,000		Tertiary		40[a]
Tremboel		1917	(*)	Ave. 2,300	(*)	355,000		Tertiary		40[a]
Total Java			4 55		1,400	120,280,000				
*Rehabilitation work delayed by unsettled political conditions.										
New Guinea:										
Klamona		1936	2 10	300-650	6,000	983,000	*3	Miocene lime		19[a]
Moeoi		1940	1 (shut in)	1,250	Shut in	500		Miocene		46[a]
Wasan		1940	2 (shut in)	2,900-3,225	Shut in	1,000		Miocene		48[a]
Total New Guinea			5 10		6,000	984,500	*3			
*Two of these are wildcat tests.										
Sumatra:										
Northern District:										
Pase		1937	(*)	Ave. 2,000	(*)	52,000		Tertiary		23[a]-30[a]
Pangkalan Brandan area:										
Dj. Rajeu		1929	(*)	2,500-2,600	(*)	559,000		Pliocene		54[a]
Gebang		1936	(*)	2,970-3,480	(*)	135,000		Miocene		54[a]
P. Taboehan		1937	(*)	3,300-3,500	(*)	3,283,000		Miocene		52[a]
Pangkalan Soesoe		1917	(*)	1,550-2,100	(*)	6,287,000		Miocene		56[a]
Perlak		1900	(*)	160-2,200	(*)	47,870,000		Miocene		57[a]
Poeloe Pandjang		1928	(*)	1,640-2,400	(*)	11,243,000		Miocene		55[a]
Rantau		1929	(*)	1,040-2,560	(*)	55,513,000		Miocene		48[a]
Serang Djaja		1926	(*)	3,560-4,150	(*)	7,551,000		Miocene		64[a]
Telaga Said-Darat-K. Gadjah		1893	(*)	210-720	(*)	23,621,000		Miocene		51[a]
Central District:										
Lirik		1941	(*)	Ave. 1,800	(*)	242,000		Tertiary		34[a]
Oekoet		1941	(*)	Ave. 1,800	(*)	1,000	1	Tertiary		34[a]
Southern District:										
Benakat		1933	101	Ave. 1,600	8,000	41,308,000		Tertiary		38[a]
Djirak		1930	76	Ave. 1,000	4,000	23,880,000		Tertiary		38[a]
Radja		1941	5	Ave. 8,000	2,000	535,000	2	Tertiary		40[a]
Selo		1938		Ave. 2,200	Shut in	47,000		Tertiary		38[a]
Talang-Akar-Pendopa		1922	302	Ave. 2,800	46,000	137,404,000	4	Tertiary		38[a]
Djambi area:										
Badjoebang		1927	12	2,700-3,100	2,600	25,042,000		Miocene		46[a]
Betoeng		1923	(*)	180-950	(*)	2,100,000		Miocene		40[a]
Kenali Asam		1931	37	1,700-4,100	9,400	19,983,000		Miocene		22[a]-46[a]
Meroeo Senami		1938	(*)	2,400-2,650	(*)	93,000		Miocene		48[a]
Tempino		1931	35	1,930-2,700	7,200	36,832,000		Miocene		48[a]
Palembang area:										
Babat		1901	(*)	100-1,050	(*)	8,136,000		Miocene		38[a]
Karang Ringin		1903	(*)	160-1,200	(*)	1,572,000		Pliocene-Miocene		42[a]
Kloeang		1914	(*)	2,300-2,600	(*)	27,882,000		Miocene		40[a]
Limau		1928	7	5,200-5,400	1,300	6,071,000	1	Miocene		25[a]
Mangoendjaja		1935	3 5	660-2,200	280	9,896,000		Pliocene		24[a]
Moeara-Enim		1903	Shut in	300-1,150	Shut in	28,172,000		Pliocene-Miocene		46[a]
Soeban Djerigi		1905	5	1,300-2,500	820	33,841,000		Pliocene-Miocene		46[a]
Talang Djimar		1937	51	3,600-4,200	13,200	37,889,000	2	Miocene		28[a]
Tandjoeng Tiga		1940		4,400-4,600	3,100	643,000	2	Miocene		25[a]
T. Loentar		1912	(*)	2,200-2,800	(*)	4,072,000		Pliocene		56[a]
Total Sumatra			634 5		97,900	601,755,000	12			
*Rehabilitation work delayed by unsettled political conditions.										

Ecuador

THE major part of Ecuador's present rather stabilized production of about 7,000 bbl. daily comes from the operations of two British companies, Anglo-Ecuadorean Oilfields, Ltd., and Ecuador Oilfields, Ltd. The fields are on Ancon Peninsula in the southwestern part of the country. The Shell organization since the end of the war has been carrying out an exploration program in the trans-Andean Ecuadorean Oriente and has drilled a series of deep wildcats. Standard Oil Co. (N.J.) took a half interest in this program late in 1948, but Shell continues the operator. Of the two producing companies, Anglo-Ecuadorean has field offices at Santa Elena, Ecuador, and its London offices at 146, Dashwood House, Old Broad Street, London, E.C.2. Ecuador Oilfields has field offices in Guayaquil, P.O. Box 865, and London offices in River Plate House, Finsbury Circus, E.C.2.

ECUADOR

Name of field—	Year of discovery	No. of producing wells: Flowing	No. of producing wells: Pumping	Producing depth	Daily avg. production (bbl.)	Accumulated production to 7-1-49 (bbl.)	Wells drilling	Name and type of formation	Gravity °A.P.I.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Ancon-Sta. Elena	1921	27		1,717	5,077	914,037		Eocene	40°
Cautivo	1920	5		1,000	1,443	259,853		Eocene	37°
Petropolis	1937	10		781	227	57,132	1	Eocene	39°
Carolina-Sta. Paula				747	129	33,347	1	Eocene	39°
Conception	1931				136	40,972		Eocene	39°
Total Ecuador		42	3,498		7,012	483,341	2		

Egypt

THE discovery and development of new producing fields on the Sinai Peninsula during the last 3 years has brought Egypt to a new all-time record production. The Sinai fields are joint operations of the Shell-controlled Anglo-Egyptian Oilfields, Ltd., and Socony-Vacuum Oil Co., Inc. Uncertainty over whether workable petroleum regulations will be provided by the government clouds the future outlook in Egypt. Standard Oil Co. of Egypt, S.A., suspended its operations early in 1949 after a discovery south of the Anglo-Egyptian-Socony-Vacuum production. Negotiations are now under way with the government over revisions in the rules which were promulgated late in 1948. Socony-Vacuum has its Egyptian headquarters at Sharia Ibrahim Pasha, Cairo; Anglo-Egyptian is officed in Shell House in Cairo. The Jersey Standard affiliate is in Al Shams Building, Midam Kasr el Doubara, Cairo.

EGYPT

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Asl	1948	3		2,870-3,870	5,400	608,000	1	Eocene lime	22°
Gemsa	1908			400-2,000		1,420,000		Miocene lime	23°
Hurghada	1913		43	700-2,500	900	37,492,000	1	Miocene-Cretaceous	23°
Ras Gharib	1938	18	47	1,200-2,500	21,900	82,706,000		Miocene-Cretaceous	26°
Ras Matama	1948	1		1,940-2,120		Shut in	1	Miocene lime	19°
Surd	1946	6		2,500-3,100	14,300	6,252,000	1	Basal Miocene-Eocene lime	23°
Total Egypt		28	90		42,500	128,478,000	4		

England-Scotland

SECONDARY recovery by water injection is being used to sustain production in the several small fields in Nottinghamshire in central England which were discovered just before the war. Output is being maintained at about 900 bbl. daily. D'Arcy Exploration Co., Ltd., (Anglo-Iranian Oil Co., Ltd.) controls virtually all the production and is continuing exploration work. Anglo-American Oil Co., Ltd., (Standard Oil Co. (N.J.)), has production of a few barrels daily. This company has discontinued exploration. D'Arcy is at Britannic House, Finsbury Circus, London, E.C.2; Anglo-American's office is 36, Queen Anne's Gate, Westminster, London, S.W.1.

ENGLAND-SCOTLAND

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Formby	1939		8	85-130	6	60,000		Upper Millstone grit	35°
Eakring	1939		55	1,800-2,500	320	1,210,000		Upper Millstone grit	33°
Dukes Wood	1941		114	1,800-2,500	440	1,960,000	1	Upper Millstone grit	33°
Kelham Hills	1941		54	2,000-2,200	160	890,000		Upper Millstone grit	28°
Caunton	1943		10	2,000-2,200	23	160,000		Upper Millstone grit	28°
Midlothian	1938		2	1,750	3	18,000		Carb.-Dalkeith	40°
Total England-Scotland			243		954	4,298,000	1		

France

THE exploration program in metropolitan France which has been carried on with government support since the end of the war was considerably encouraged as a result of the success of the Soultz-sous-Forets wildcat in Alsace Province. The well has shown for a production of several hundred barrels daily from about 2,800 ft. The operator is Soc. de Pechelbronn which has practically all the French production from the shallow formations of the old Pechelbronn field. Soc. Nationale des Petroles d'Aquitaine made a discovery near Lembeyge which has not yet been fully evaluated. Natural-gas production by Regie Autonome des Petroles in the St. Marcet area is being expanded, and a small amount of oil is being produced in the field. Other exploration is being carried on in southern France by Soc. Nationale des Petroles du Languedoc Mediterraneen. Addresses of these companies are: Pechelbronn, 4, Rue Leon Jost, Paris (17eme), and Merkwiller-Pechelbronn (Bas-Rhin); S.N.P.A., 11, Rue du Doctuer Lancereaux, Paris (8eme), and field office, 15, Rue Langanne, Toulouse (Hte.-Garonne); R.A.P., 40, Avenue Marceau, Paris (8eme), and head office, 27, Rue de la Republique, Saint Gaudens (Hte.-Garonne); and S.N.P.L.M., 39 bis, Rue de Chateaudun, Paris; and head office, Villa Elisabeth, Chemin du Pioh de Boutonnet, Montpellier (Herault).

FRANCE

Name of field—	Year of discovery	No. of producing wells: Flowing	No. of producing wells: Pumping	Producing depth	Daily avg. production (bbl.)	Accumulated production to 7-1-49 (bbl.)	Wells drilling	Name and type of formation	Gravity °A.P.I.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Pechelbronn	1813		665	170-3,000	1,100	184,365,000	2	Oligocene-Jurassic-Triassic	32°
St. Marcet	1939	10 (gas) 2 (oil)		5,000	15	36,850	2	Jurassic-Cretaceous	30°
Total France		12	665		1,115	184,401,850	4		

French Morocco

OIL operations in French Morocco are in the hands of Soc. Cherifienne des Petroles (S.C.P.), which is jointly owned by the French and Moroccan governments. An intensive exploration program is being carried out, though no substantial production has been reported. Offices at 38, Rue de la Republique, Rabat (Maroc).

FRENCH MOROCCO

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Oued Beth	1947	9		3,165	283	145,300	4	Primaire	34°
Tselfat	1934		1	830	7	132,100		Toarcian	45°
Ain Hamra	1918		18	500	13	59,100		Tortonian	45°
Total French Morocco		9	19		303	336,500	4		

Germany

TWO discoveries of apparent importance have been made in western Germany during the past year. These, together with extensions and stepouts, have brought western German production to a record level and are encouraging continued exploration. Of the two major discoveries, Ruehlertwist-Ruehlermoor in the Emsland area has been extended across the Dutch border. The concession is held by four German companies with Wintershall, A.G., the operator. The second discovery was by Gewerkschaft Brigitta in the Hanover area of central Germany on a concession held jointly with Deutsche Vacuum Oel, A.G. The well, 1 Suderbruch, was productive in the deeper formations at about 6,800 ft. German exploration and production are being carried out by a number of German companies and two foreign organizations. Among the major German companies are Gewerkschaft Elwerath, Hanover; Deutche Erdoel Hamburg; and Wintershall, Celle. The foreign companies are Brigitta (Standard Oil Co. [N.J.] and Shell), Steimbke; and Vacuum, Celle.

GERMANY

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Hanover District:									
Broistedt	1937			2,400-3,200	96			Lower Cretaceous	33°
Calberlah	1945			160-400	36			Jurassic sand	21°
Eddesse-Olheim	1876			2,800-3,300	51			Triassic sand	32°
Ehra	1939			500-820	10			Jurassic sand	16°
Eicklingen-Wienhausen	1937			1,600-3,100	207			Cretaceous sand	32°
Eilte	1947		1	3,560-3,700	5	2,000		Lower Cretaceous	23°
Etzel	1942			4,500-4,700	51			Jurassic lime	13°
Fuhrberg-Hambuchren	1939		45	560-2,130	965	1,013,000		Jurassic-Triassic	24°
Gifhorn	1935			660-820	33			Cretaceous sand	17°
Hademstorf	1941		10	3,970-4,480	275	347,000	1	Lower Cretaceous	25°
Hohenassel	1943			1,200-2,100	363			Jurassic lime	30°
Meckelfeld	1938			1,000-1,670	65			U. Cretaceous ls., L. Cretaceous sand	24°
Moelme	1935			160-1,800	124			Cret.; Jur.; Triassic	32°
Nienhagen-Hanigsen	1899		9	600-5,350	2,300	760,000		Jurassic; Cretaceous	22°-40°
Oberg	1919		62	500-1,900	150	1,902,000	1	L. Cret.-Jurassic	38°
Steimbke-Rodewald	1936	3	200	660-2,460	1,100	3,020,000	3	L. Cret.-Jurassic	19°
Stemmerberg	1948			2,600	1			Jurassic sand	25°
Suderbruch	1949	1		6,400	120			Cornbrash	
Thoren	1941		56	1,500-4,000	348	474,000	2	Cret.-Jur.-Triassic	19°-35°
Wesendorf	1943			2,600-6,000	1,240			Jurassic sand	35°
Wietze	1874			300-1,080	507			Cretaceous-Jurassic	18°-27°
Emsland District:									
Emlichheim	1943			2,400-2,900	2,680			Lower Cret. sand	25°
Georgsdorf	1944			1,600-3,300	3,230			Lower Cret. sand	24°
Adorf	1946			4,000-4,400	39			Lower Cret. sand	30°
Ruehlermoor	1949	2		2,450	14			Lower Cret. sand	30°
Lingen	1942			2,800-3,800	1,192			L. Cret. sd., Jurassic	31°
Baden District:									
Forst-Weiher	1934			1,000-2,500	59			Ter.-Jur.-Triassic	33°
Weingarten	1936			800-1,600	52			Tertiary	34°
Schleswig District:									
Heide	1935			2,500-4,500	1,147			L. Cret.-Paleozoic	31°
Hamburg District:									
Reitbrook	1937	45	53	1,400-2,600	852	3,867,000	1	Ter. sd.; Cret. lime	22°
Total Germany					17,312				

Note—Of fields showing some data on wells and production, only Eilte and Hademstorf look complete. Oberg might be close. Other fields, data is obviously only part of total field.

Hungary

HUNGARY is believed to be producing between 10,000 and 11,000 bbl. daily, all from the properties west of the Danube River which the Communist government seized from the Standard Oil Co. (N.J.) affiliate, MAORT, a year and a half ago. These are gas-drive fields, and in the absence of careful production control and further

MAXIM IS PART OF THIS IMPORTANT PICTURE

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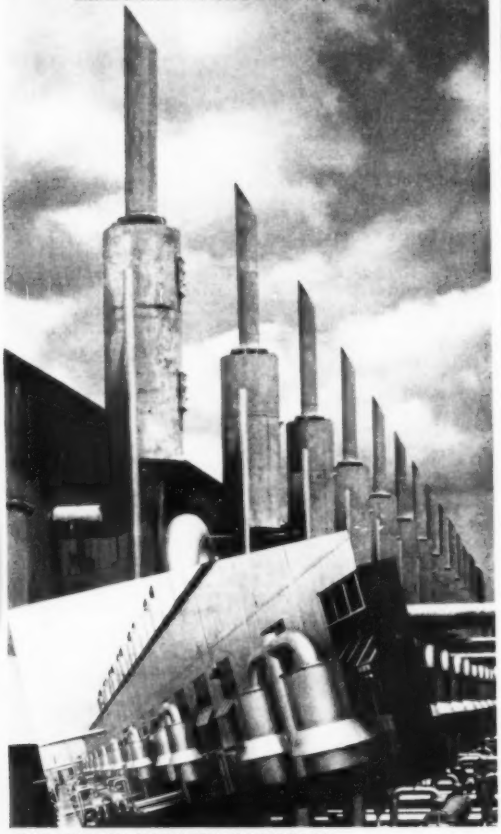
The Maxim exhaust silencers shown here provide quiet operation of 26 gas compressors totaling 18,400 H. P. Top picture at Antioch, bottom at Lindsay, Oklahoma; both plants engineered and constructed by Dresser Engineering Company of Tulsa for Warren Petroleum Corporation and associates... just another proof that Maxim Silencers are found in most important pictures.



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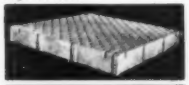
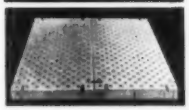


5' x 5' BENDING TABLE Standard sizes of American combination bending tables for all kinds of hot or cold bending problems.



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Hungary (Continued)

drilling, output can be expected to decline in the near future. The Hungarians have moved to headquarters of the MAORT operation from Budapest to Nagy Kanizsa near the fields. East of the Danube, exploration was in charge of a joint Russian-Hungarian company but as far as is known, promising shows in this area have never been developed. Hungary has blacked out all information on its oil industry since taking over the Standard of New Jersey affiliate.

HUNGARY*

Name of field	Year of discovery	No. of producing wells: Flowing	No. of producing wells: Pumping	Producing depth	Daily avg. production (bbl.)	Accumulated production to 7-1-49 (bbl.)	Wells drilling	Name and type of formation	Gravity A.P.I.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Budafapustza	1937			3,500-3,900		‡16,682,000		L. Pannonian (Pliocene)	38°
Lovaszi	1940			3,950-4,900		‡21,771,000		L. Pannonian (Pliocene)	43°
Hahot	1942			4,675-4,900		‡3,080,000		L. Pannonian (Pliocene)	30°
Ujfalu	1941			2,000	Abandoned	‡13,300		L. Pannonian (Pliocene)	40°
Bukkszek	1937			250-4,500	Abandoned			Oligocene	
Total Hungary		98	†62			‡41,456,000			

*Communist dominated, no current data available. †Gas lift or pumping. ‡To September 24, 1948, nationalization date.

India

DIGBOI field in Assam in extreme northeast India with a production of about 5,200 bbl. daily is the only active producing area in India. It is operated by Assam Oil Co., Ltd., a subsidiary of Burmah Oil Co., Ltd., Digboi P.O., Lakhimpur Dist. Assam. Some exploration work is being done by Burmah Oil Co. (India Concessions) Ltd., which last summer was preparing to spud in a wildcat about 125 miles southwest of the present fields. Burmah Oil (India Concessions) is at P.O. Box 2039, 7 Wellsley Place, Calcutta, India.

INDIA

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Digboi	1890	483	242	500-5,000	5,200	42,000,000	6	Tipam ss.-Miocene	36°

Iran

ANGLO-IRANIAN OIL CO., LTD., is carrying out a normal program of exploratory and development drilling in its concession area in Iran. One unsuccessful wildcat was drilled, and another under way the latter half of the year. The 1949 program included eight development wells. In late spring, the company completed its new Agha Jari-Bandar Mashur 20 and 22-in. pipe line which is capable of delivering about 100,000 bbl. daily to loading facilities on the Persian Gulf. On the political side, the company and the government reached an agreement providing a 50 per cent increase in royalty but Parliament dissolved without acting on the matter. Anglo-Iranian's London offices are in the Britannic House, Finsbury Circus, London E.C.2; field headquarters are at Abadan, Khuzistan, Iran.

IRAN

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Masjid-i-Sulaiman	1908	29		2,000-3,000	*55,000	820,000,000		Oligocene-Miocene	38°
Lali	1946	1		6,500	13,000	6,000,000	2	Oligocene-Miocene	37°
Haft Kel	1928	19		3,000-4,000	190,000	875,000,000		Oligocene-Miocene	38°
Naft Safid	1938	3		5,500	20,000	18,000,000	2	Oligocene-Miocene	40°
Gach Saran	1937	3		4,000-7,000	37,000	97,000,000		Oligocene-Miocene	33°
Agha Jari	1937-38	13		6,000-9,000	245,000	200,000,000	4	Oligocene-Miocene	35°
Naft-i-Shah	1923	4		2,600-3,000	10,000	41,800,000		Oligocene-Miocene	43°
Naft Khaneh	1926			2,600-3,000					
Total Iran		72			570,000	2,057,800,000	8		

*Net production, i.e., after deducting recycled products.

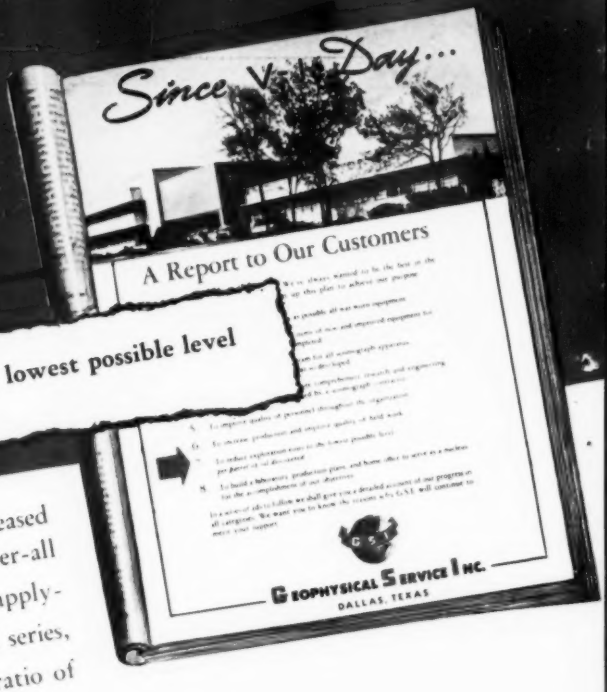
Iraq

OPERATIONS in Iraq are in charge of Iraq Petroleum Co., Ltd., except for the Naft Khaneh area of the Anglo-Iranian Oil Co., Ltd., subsidiary, Khanaqin Oil Co., Ltd. I.P.C. operates in the Kirkuk area, and its associated company, Mosul Petroleum Co., Ltd., has the northwestern area. Another I.P.C. associate, Basrah Petroleum Co., Ltd., holds rights in the southern and southwestern part of Iraq. Mosul Petroleum has a shut-in field at Ain Zalah and plans to spud in a deep test there in the near future. Basrah Petroleum has completed one well, is testing another, and drilling three others in the area west of the city of Basrah. At least one new field has been indicated in this section. I.P.C.'s Middle East headquarters are in Tripoli, Lebanon; its London offices are at 214, Oxford Street, Oxford Circus, London W.1.

IRAQ

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Basrah	1949	1					3		
Kirkuk	1927	12		Ave. 2,750	75,000	402,000,000	4	Qarah chalk limestone	36°
Ain Zalah	1940	4		Ave. 5,500	Shut in	Not produced yet	2	Cretaceous limestone	33°
Qaiyarah	1927	1		840	Shut in	Not produced yet		Miocene-Cretaceous	16°
Total Iraq		18			75,000	402,000,000	9		

Report No. 7

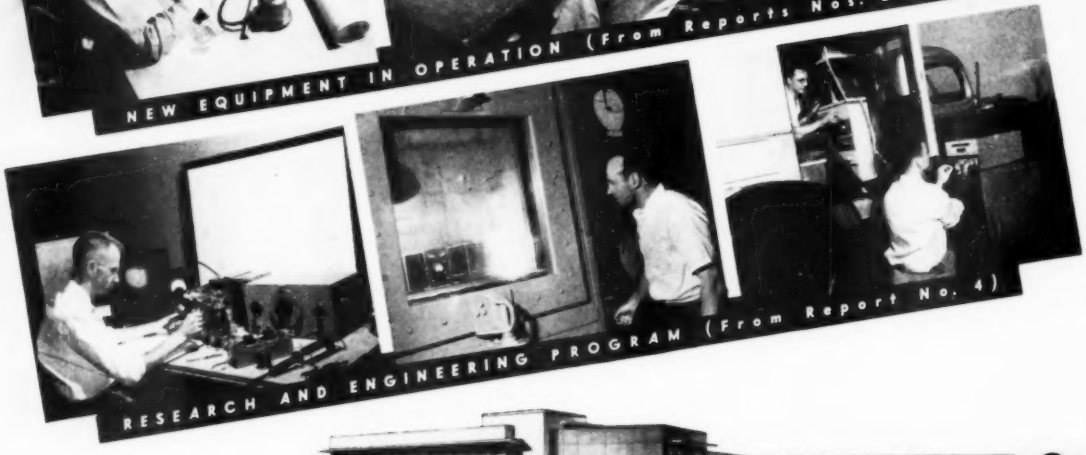


7. To reduce exploration costs to the lowest possible level *per barrel of oil discovered.*

The cost of GSI seismic service has increased less than 50% since the war . . . while over-all drilling costs have increased 160%*. By applying the factors presented in this report series, GSI will maintain — or *better* — the ratio of these percentages.

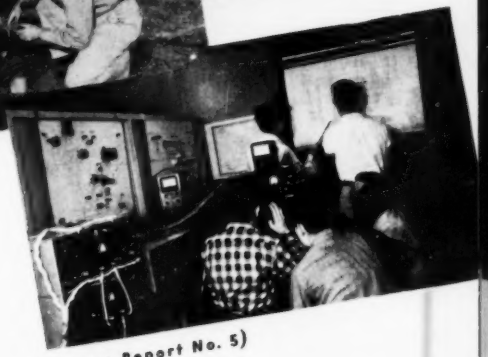
*Source: Petroleum Data Book, 1948.

NEW EQUIPMENT IN OPERATION (From Reports Nos. 2 and 3)



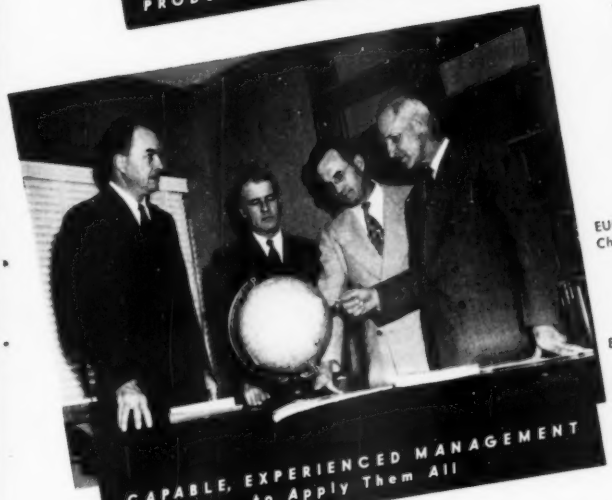
RESEARCH AND ENGINEERING PROGRAM (From Report No. 4)

PERSONNEL SELECTION AND TRAINING



(From Report No. 5)

EFFICIENT FIELD OPERATIONS WITH PRODUCTION CONSCIOUS PERSONNEL



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(From Report No. 6)

GEOPHYSICAL SERVICE INC.

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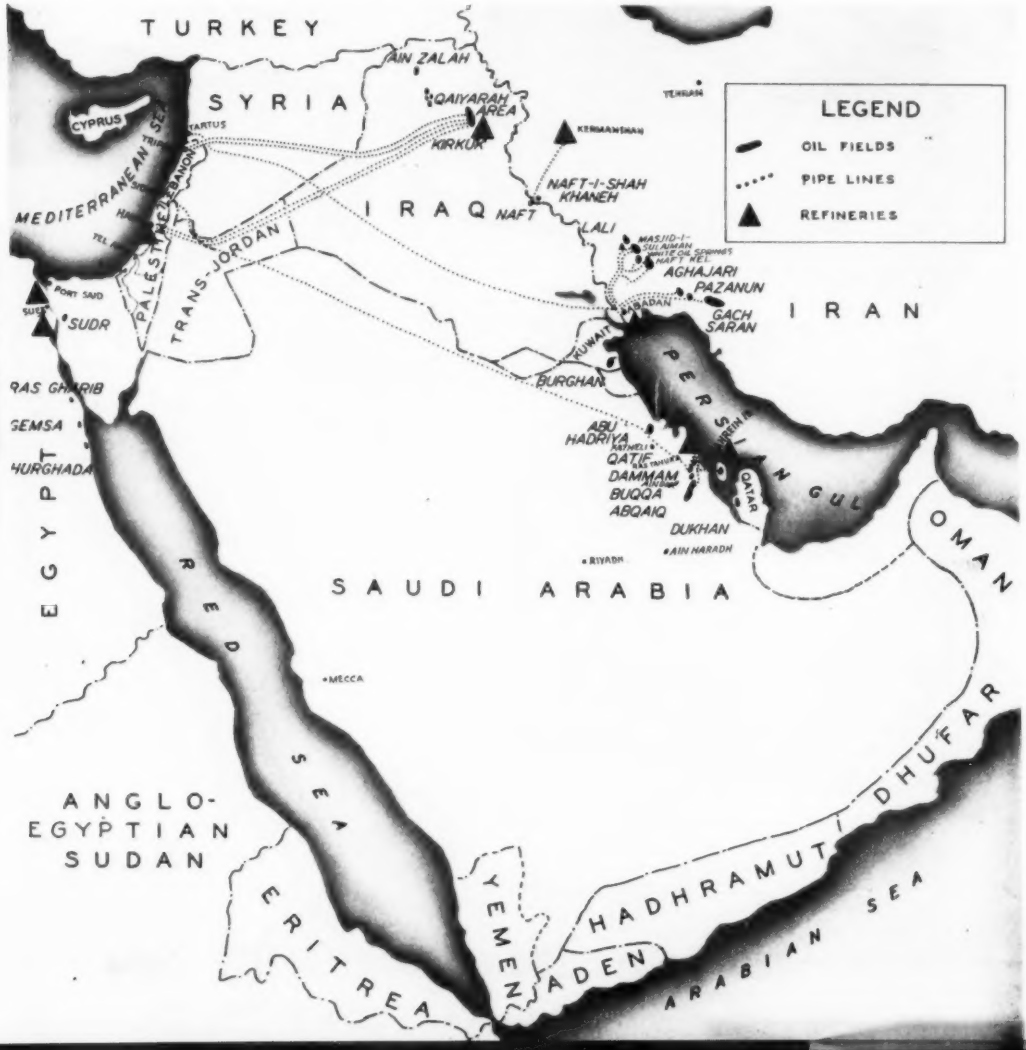
Italy

OVERSHADOWING actual exploration and production developments in Italy over the last year has been the controversy over private versus state control of the industry. Amendments were proposed to the old Italian Mining Law which would give private operators a workable basis for exploration and production, but these have not been fully accepted by the government and the probable outcome is some form of limited private operations, possibly mixed companies. Italy is regarded by some geologists as offering the best oil possibilities in western Europe. Considerable gas production has been developed in the Po Valley, and this summer Azienda Generale Italiana Petroli found oil in a well on the Cortemaggiore structure in the Upper Po Valley. Complete details on this discovery are lacking. AGIP's offices are given as Via. del Tritone 181, Rome, Italy. Working on restricted blocks and under the limitations of the old law, Soc. Petrolifera Italiana, Fornova-Taro, Parma, the Standard Oil Co. (N.J.) affiliate, has developed most of Italy's present small production.

ITALY

Name of field—	Year of discovery	No. of producing wells: Flowing	No. of producing wells: Pumping	Producing depth	Daily avg. production (bbl.)	Accumulated production to 7-1-49 (bbl.)	Wells drilling	Name and type of formation	Gravity A.P.I.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Vallezza	1909		155	1,600-2,400	71	951,046		Tongrain, Oligocene	50°
Montechino									
Vizzola	1941		3	1,900	2	18,499		Piacentian, Pliocene	31°
Salsomaggiore area:									
Centopozzi	1923		61	500-1,600	14	469,759		Tongrain, Oligocene	40°-42°
Salsomaggiore				500-1,600				Tongrain, Oligocene	40°-42°
Salsominore	1923		3	500-1,600	1	35,088		Tongrain, Oligocene	40°-42°
Total Italy			222		188				



Japan

APPROXIMATELY 95 per cent of the producing areas in Japan are controlled by the government's Imperial Oil Co. Per well production is extremely low, and the equipment antiquated by western standards. Formerly a subsidy was given to stimulate drilling. Since the war additional drilling has been recommended by geophysical advisers, but any large increase in Japanese production is not considered likely. Expense involved in a well of 5,000 to 6,000 ft. would be a serious obstacle for a Japanese company without a subsidy. An encouraging development this summer was the discovery of additional production in a deeper test in Yabase in northern Japan.

JAPAN

Name of field—	Year of discovery	No. of producing wells: Flowing	No. of producing wells: Pumping	Producing depth	Daily avg. production (bbl.)	Accumulated production to 7-1-49 (bbl.)	Wells drilling	Name and type of formation	Gravity °A.P.I.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Hokkaido Prefecture	1905				70			Tertiary	
Akita Prefecture	1902			300-3,900	2,550			Tertiary	21°-40°
Yamagata Prefecture	1922			2,600-5,000	300			Tertiary	27°-37°
Niigata Prefecture	1874			1,000-4,500	960			Tertiary	17°-35°
Shizoku Prefecture	1908			.....	(*)			Tertiary	
Nagano Prefecture				.....	(*)			.....	
Total Japan					3,880				

*Less than 1 bbl. per day.

Kuwait

BESIDES normal field drilling in Burghan field, Kuwait Oil Co., Ltd., late this summer spudded in an important deep test designed to determine possibilities of production from formations underlying the Burghan sand pay zones. Already ranked as the world's largest single oil reservoir, Burghan is not yet completely defined. The operating company is owned jointly by Gulf Oil Corp. and Anglo-Iranian Oil Co., Ltd. Its London offices are at 1, Great Cumberland Place, London, W.1; field office is at Kuwait, Persian Gulf. The company now has under construction a topping plant for local requirements, and is nearing completion on a marine terminal.

KUWAIT

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Burgan	1938	61		4,000-4,750	226,000	113,984,146	12	Middle Cretaceous	31.8

Mexico

THE past year in Mexico has seen the commencement of drilling operations on wildcat prospects by a private American group, Mexican American Independent Co. In early October, the company began its first well in Vera Cruz near Coatzacoalcos. Its contract calls for payment as a percentage of any production obtained. In Northeastern Mexico, exploration operations over a large area are continuing under an earlier arrangement between Petroleos Mexicanos and Cities Service Co. whereby the American company is providing funds and technical assistance for the work. Outside these and some other smaller operations, largely of a drilling-contractor type, Mexican oil exploration and production remains under Pemex. Well over half of the country's production, which is in approximate net balance with consumption, comes from Poza Rica. Pemex Mexico City offices are Av. Juarez, 92 and 94, Mexico, D.F. Majority interest in Mexican American Independent is held by American Independent Oil Co., 111 Sutter Street, San Francisco 4.

MEXICO

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Camargo y Valadeces	1947	3		2,165	22	4,746		Marine-Vicksburg-Oligocene	
Mision	1945	2		5,840	108	72,888		Marine-Vicksburg-Oligocene	
Reynosa	1948	8		4,690	1,059	247,128	3	Frio-Oligocene	
Reynosa	1948	2		8,112	26	4,634	1	Marine-Vicksburg-Oligocene	
Francisco Cano	1949	1		5,888	32	5,873	1	Frio-Oligocene	
Brasil	1949	1		8,578		44	1	Frio-Oligocene	
Northern District (Ebano Panuco, etc.)	1901	569		1,148	25,842	805,990,649	5	Lower Cretaceous	12°
Southern District (Golden Lane)	1908	194		2,200	18,009	1,087,919,996		Lower Cretaceous	20°
(Moralillo)	1948	10		5,305	1,999	610,673	3	Lower Cretaceous	21°
(Alazan)	1949	1		2,403	150	27,212	3	Lower Cretaceous	
Poza Rica	1930	72		7,250	95,513	345,157,236	3	Lower Cretaceous	30°
Other fields: (San Sebastian, Tanhuijo, Mecatepec, Furbero)		1			46	4,169,393			
Southern Zone:									
Cuichapa	1934	6	8	2,100	1,006	2,600,495	1	Miocene	30°
Acalapa	1947	4		2,526	722	250,298	1	Miocene	30°
El Burro	1930		28	2,460	1,221	17,487,607		Miocene	26°
El Plan	1931	44	13	5,734	10,663	57,670,286	4	Miocene	24°-35°
Filisola	1921		36	1,585	777	21,437,745		Miocene	22°
Teapa Nuevo	1928			429	4	229,902		Miocene	36°
Tonala	1928		74	1,640	2,141	46,374,557		Miocene	28
Moloacan	1948	4		1,483	176	33,131	2	Miocene	
Fortuna Nacional	1949	1		6,971	8	1,473	1		
Other fields (San Cristobal, Capoacan, Concepcion, Tecuanapa, Ixhautlan, Belam, Sarlat, etc.)		1				377,301			
Total Mexico		924	159		159,524	2,400,673,269	29		

"Whirling on center" is the key to Cementing Success

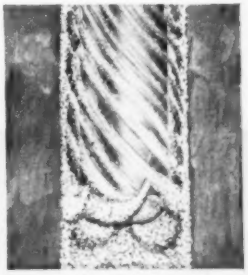
NO OTHER EQUIPMENT—no other method of cementing—provides such assurance of successful "first-time" cementing as the exclusive Baker Principle of "whirling" the cement up and around casing which is effectively centered in the well with Baker Model "G" Casing Centralizers.

Not only can you REMOVE BRIDGES which might stick the casing, not only can you wash the wall of the hole to help REMOVE MUD CAKE and leave the formation prepared for effective bonding with the cement to follow, but the definite *downward*, then *upward* whirling motion of the cement slurry REDUCES THE HAZARD OF CHANNELING TO A MINIMUM, and assures COMPLETE ENCASEMENT OF THE PIPE at the critical shoe joint with a uniform body of cement.

Study the illustrations below for visual proof of what "whirling" means to you.

The downward hydraulicking action of the circulating fluid through the baffled side down-whirler ports, and the nozzle-like bottom passageway, effectively remove bridges and permits safe running of the casing string.

When washing the formation at the cementing point to condition the hole, the "whirling" motion of the fluid helps remove mud cake from side walls. This *downward* whirling is far superior to any *side* jetting action, and does not cause caving or crumbling of soft formations.



The "whirling" motion given to the cement slurry as it is discharged from a Baker Wash-Down Whirler Shoe causes the cement to encase the centered shoe joint with a uniform body of cement, and reduces to a minimum the hazard of channeling.

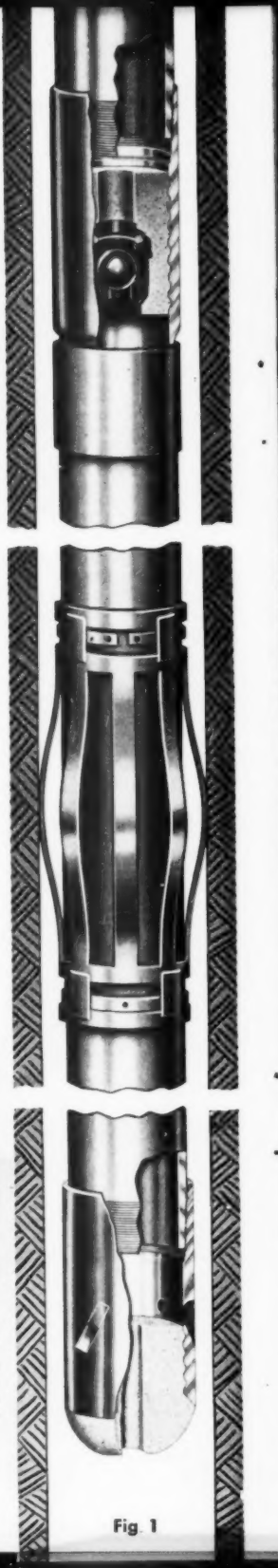


Fig. 1

Fig. 2

EVERY cementing job should be performed with equipment which provides maximum FLOATING EFFICIENCY • LANDING EFFICIENCY • CEMENTING EFFICIENCY . . . with COMPLETE DRILLABILITY and PROVEN DEPENDABILITY

When you use Baker Cement Equipment you *know* that the buoyant ball will seal against the resilient rubber ring (backed by sturdy interior construction) to provide leak-proof strength for FLOATING those long, heavy strings of casing. You *know* you can raise and lower the string to insure PERFECT LANDING at the desired depth. You *know* you will secure maximum CEMENTING EFFICIENCY by the "whirling" cement slurry, combined with COMPLETE DRILLABILITY. You will enjoy that peace of mind which comes from using equipment of PROVEN DEPENDABILITY in thousands of jobs under every imaginable well condition.

RESULTS ARE WHAT REALLY COUNT

You are assured of RESULTS when you use Baker Hook-Ups like those pictured at left. For wells up to average depth, use a Baker Cement Wash-Down Whirler Guide Shoe (Product No. 121) with Baker Model "G" Casing Centralizers (Product No 910-G) spaced throughout the cementing area to provide *maximum centering force at the cementing point*. Then with a Baker Cement Float Collar (Product No. 101 M&F) positioned a joint or two above the shoe, you have the world's best "float valve" for safety, plus a "stop" for the cementing plug so that cement tailings are retained inside of the casing. See Figure 1.

For deeper wells, where maximum "floating" strength is a worthwhile precaution, a Baker Cement Wash-Down Whirler Float Shoe (Product No. 120) used on the bottom of the string (Figure 2) gives double safety at negligible cost.

YOU GET EFFICIENT RESULTS WHEN YOU COME TO "CEMENTING HEADQUARTERS"

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Netherlands

ONLY company engaged in exploration and production in the Netherlands is Nederlandse Aardolie Mij., jointly owned by Royal Dutch-Shell and Standard Oil Co. (N.J.). It is headquartered at Carel van Bylandtlaan, 30, The Hague, with field offices at Oldenzaal. The production comes entirely from the war-developed Schoonebeek field on the German border now being held to its economic output of about 11,000-12,000 bbl. daily. The company is drilling other prospects in the country, has had a gas discovery west of Schoonebeek, and is developing other production on the west Dutch extension of the new Ruehlertwist-Ruehlermoor field in Germany.

NETHERLANDS

Name of field—	Year of discovery	No. of producing wells: Flowing	Pumping	Producing depth	Daily avg. production (bbl.)	Accumulated production to 7-1-49 (bbl.)	Wells drilling	Name and type of formation	Gravity °A.P.I.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Schoonebeek	1943		79	2,500	11,790	7,505,300	8	Lower Cretaceous sd.	24.8

Pakistan

PAKISTAN'S production in Punjab is controlled by Attock Oil Co., Ltd. It consists of the light oil from the original Khaur and Dhulian and the heavy asphaltic crude from the newer Joya Mair and Balkassar. Exploration in Pakistan is being carried out by Burmah Oil Co., (Pakistan Concessions) Ltd., whose Lahkra wildcat has set a depth record for the Indian subcontinent. Burmah Oil also brought in a new producer in the Punjab area with its 2 Chakwal. The Pakistan Government recently announced new regulations for exploration and production in the country. These appear workable and apparently were designed to attract more capital into developing possible further production. Attock Oil's London headquarters are at 24-28, Lombard Street, London, E.C.3, and field offices at Rawalpindi, Punjab, Pakistan. Burmah Oil (Pakistan Concessions) is located in Karachi, Pakistan. The London office of the parent company is in Britannic House, Finsbury Circus, London

PAKISTAN

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Khaur	1915			To 5,200				Eocene and Upper Tertiary sands	37°
Dhulian	1937			To 7,800				Eocene lime	35°
Joya Mair	1944	2		To 7,000				Eocene lime	22°
Balkassar	1946	5		To 8,200				Eocene lime	26°
Total Pakistan		7			1,800				

Peru

APPROXIMATELY 80 per cent of Peru's production of about 40,000 bbl. daily is produced by International Petroleum Co., Ltd. Output in the company's fields on the La Brea-Parinas Estate has been sustained by active drilling in the individual faulted reservoirs. Other coastal-area production is obtained by Cia. Petrolera Lobitos and the government's Empresa Petrolera Fiscal. Develoment of major production in the Trans-Andean Montana has long been hoped for but preliminary exploration of this region has been discontinued by the major operators pending a more favorable legal situation. Meanwhile, Ganzo Anzul (Blue Goose) Petroleum Co., with Lima offices in Edificio San Martin, Boza 892 (P.O. Box 2560), continues as the only producer in eastern Peru, meeting local requirements along the headwaters of the Amazon from its Agua Caliente concession and small refinery. The Peruvian Government has recently given indication of providing more workable laws for the oil industry. International has offices in Lima and Talara with its main headquarters at 434 University Avenue, Toronto 2. Lobitos has main offices at 146 Dashwood House, Old Broad Street, London, E.C.2.

PERU

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Agua Caliente	1938	6		1,100	750	608,000		Middle Cretaceous sd.	44°
La Brea-Parinas	1888	236	1,940	500-7,000	32,600	305,954,000	14	Eocene sands	36°
Lobitos	1902	67	891	500-6,500	7,100		15	Eocene-Olig. sds.	29°-41°
Los Organos	1943		14	1,800	300	536,000	4	Tertiary sand	43°
Zorritos	1863		30	1,800	40	3,561,000		Tertiary sand	37°
Cope	1938		8	600	10	108,000		Tertiary sand	34°
Total Peru		309	2,883		40,800	310,767,000	33		

Poland

LITTLE detailed information on the progress of the nationalized petroleum industry in Poland is available. The country lost some of its producing fields in boundary changes with Russia after the war. Indigenous production satisfies only 25 to 30 per cent of demand, and efforts to increase output have been hampered by shortages of equipment. The 1949 program for the Polish oil industry included among its projects pressure stabilization of crude, facilities for sulfur removal from gas; home production of rotary-drilling tools, and plans for Barisol paraffin removal.

POLAND*

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Gorlice-Lipinski	1885								
Grabownica	1896								
Wankowa	1885								
Turaszowka									
Bobrka	1858								
Harklowa	1870								
Zmiennica	1896								
Miscellaneous	Various								
Total Poland									

*Communist dominated, no current data available.

WHELAND'S Exclusive
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EFFICIENCY INCREASED 12% TO 15%

In the Wheland H-20000 steam pump the steam and exhaust piston valves are below the steam cylinders.

Every stroke of the piston drains and blows all condensate, scale or rust down and out of the cylinder. This construction increases the efficiency by 12 per cent to 15 per cent. This pump will maintain its stroke at a slower speed than any competitive pump on the market.

After one of these pumps had drilled more than 25 deep wells, it was dismantled and the cylinder carefully "miked". It was still in perfect condition with practically no wear.

The many exclusive Wheland features add up to more pressure, more mud and more dependability.

WHELAND DUPLEX STEAM SLUSH PUMP

Model H-20000-BB.....16½"x8"x20" with Cast STEEL Fluid End.
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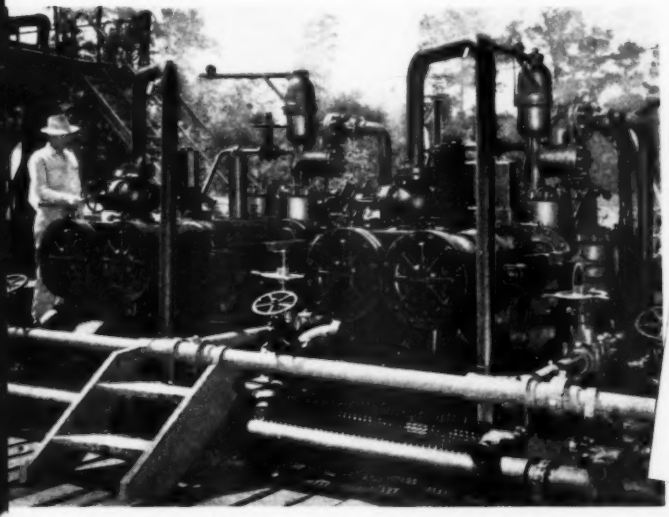

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Your upside-down self-draining valve construction and the easily accessible fluid end are real features. We have found the performance of these pumps satisfactory in every way.

Yours very truly

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By Lester O. Housh

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Qatar

OIL was discovered on this Persian Gulf peninsula before the war, but the three wells were plugged. The work was resumed after the war by Petroleum Development (Qatar) Ltd., and seven wells have been completed with two more drilling. A pipe line across the peninsula to a loading station on the southeast coast is virtually completed, and shipments are to start in the near future. Petroleum Development (Qatar) is associated with Iraq Petroleum Co., Ltd., which has headquarters for the Middle East at Tripoli, Lebanon.

QATAR

Name of field—	Year of discovery	No. of producing wells: Flowing	Pumping	Producing depth	Daily avg. production (bbl.)	Accumulated production to 7-1-49 (bbl.)	Wells drilling	Name and type of formation	Gravity °A.P.I.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dukhan	1940	7		6,000	Shut in	Shut in	2	Jurassic	36°

Romania

THE Romanian oil industry, largest in Europe, was nationalized in June 1948 by the Communist-controlled government. The Russians, represented in the Sovrompetrol Group, took a favored position but British and American foreign holdings were confiscated after a period of persecution of the managements. Production in 1948 is believed to have been about 93,000 bbl. daily, but it is reported this output was forced by the Communists in order to justify their program. Production in 1947 was about 79,000 bbl. daily. It is estimated output in 1949 will be slightly below 90,000 bbl. daily. A continued drop is foreseen because of operational troubles in the government organization and also because of an equipment shortage. Much of the relatively small amount of equipment being received comes from Czechoslovakia, and the soft steel in drill pipe and other material is said to be a major source of trouble. Some of these difficulties have been admitted by the Romanian Communists. Romania has a refinery capacity totaling about 140,000 bbl. daily. Runs are reported in excess of production, apparently representing either stock withdrawals or crude imports from Russia or its satellites. As in other Communist countries, reliable information on the oil industry is not obtainable in detail.

ROMANIA*

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Baicoi†	1861			600-9,800				Pliocene-Dacic and Meotic	39°
Boldesti	1922			6,900-7,900				Pliocene-Dacic and Meotic	37°
Bucsani	1933			6,500-7,300				Pliocene-Dacic and Meotic	38°
Ceptura	1913			2,400-4,100				Pliocene-Dacic and Meotic	34°
Gura Ocnitei‡	1929			5,400-5,900				Pliocene-Dacic and Miocene	33°
Margineni	1935			6,100-7,500				Pliocene (Dacic) and Miocene (Helvation)	39°
Moreni§	1903			1,400-5,600				Pliocene (Meotic-Dacic)	
Piscuri¶	1927			1,200-4,000				Pliocene-Meotic	33°
Floresti†	1933			6,900-7,500				Pliocene	39°
Pacureti	1899			2,000-4,000				Pliocene (Dacic, Pontic, Meotic)	
Total Romania					Est. 89,000				

*Communist dominated, no current data available. †Includes Liliesti and Tintea. ‡Includes W. Gura Ocnitei, Ochiuri and Rasvad. §Includes Ghirdoveni. ¶Includes Filipesti de Padure. Includes Ditesti and Calinesti.

Russia

RUSSIA'S oil industry continues to operate behind the barrier of official secrecy, and little is known of its activities outside of the information contained in an occasional Moscow broadcast or Soviet press story. The old Baku fields are known to be declining. Some of this may be due to overproduction practices such as the Russians demonstrated in Austria. Early this year the Russian oil minister criticized the work of the state administration at Baku, and admitted the country lacked reliable equipment and tanker transportation. This latter deficiency is borne out by recent use by the Russians of chartered American tankers to carry oil from Romania to the Far East. The 1950 Russian production goal is about 683,000 bbl. daily.

Saudi Arabia

OPERATIONS in Saudi Arabia have been reduced during the past year. Production is below the level anticipated. This is the result principally of currency problems abroad. Arabian American Oil Co., whose four parent companies market its oil in many soft-currency areas, has been particularly affected by exchange difficulties. Development drilling continues, and the company has been engaged in exploratory work offshore. During the year two wildcats, Haradh south of Ain Dar and Fathili northwest of Dammam, both showed new production. Aramco's New York offices have been centered in new headquarters at 505 Park Avenue; its field offices are at Dharan, Saudi Arabia.

SAUDI ARABIA

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Abqaiq	1941	50		6,800	375,000	257,352,000	2	Arab zone-Jurassic lime	38°
Abu Radriya	1940	1		10,200	Shut in	10,000		Hadrya zone, Jur. ls.	36°
Ain Dar	1948	4		7,100	Shut in	Shut in	1	Arab. zone, Jur. ls.	32°
Damman	1938	32		4,800	89,000	170,829,000		Arab. zone, Jur. ls.	34°
Fadhili	1949	1		10,670	Shut in	Shut in		Arab zone, Jur. ls.	38°
Haradh	1949	2		6,500	Shut in	Shut in	1	Arab zone, Jur. ls.	31°
Qatif	1945	7		7,300	15,000	8,916,000	1	Arab zone, Jur. ls.	34°
Total Saudi Arabia		97			479,000	437,107,000	5		

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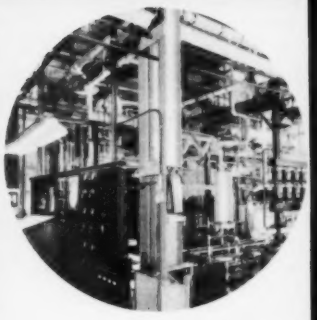
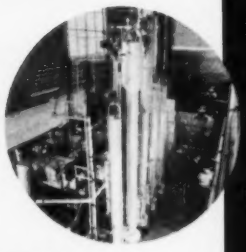
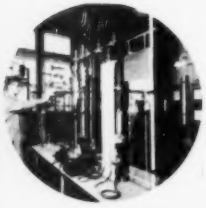


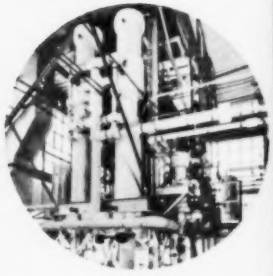
Vacuum Distillation



Precise Fractionation



Analytical Distillation



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Trinidad

TRINIDAD production is being maintained at a daily rate of about 55,000-56,000 bbl. but the outlook for maintaining reserves with lower oil prices and heavy costs and taxes is becoming of increasing concern. The largest producer in Trinidad is Trinidad Leaseholds, Ltd., New York offices at 445 Park Avenue; London headquarters at 4 London Wall Buildings, London, E.C.2; and Trinidad offices in Pointe-a-Pierre. Other producing companies in Trinidad include: Antilles Petroleum Co. (Trinidad) Ltd., P.O. Box 31, San Fernando; Apex (Trinidad Oilfields, Ltd., 208-224 Salisbury House, London Wall, London, E.C.2, and Siparia P.O., in Trinidad; Kern Trinidad Oilfields, Ltd., Kern House, 36 and 38, Kingsway, London, W.C.2, and Box 55, San Fernando; National Mining Corp., Ltd., 66, Gresham Street, London, E.C.2, and San Fernando; Trinidad Petroleum Development Co., Ltd., River Plate House, Finsbury Circus, London, E.C.2, and Siparia, Palo Seco; and United British Oilfields of Trinidad, Ltd., St. Helen's, Great St. Helen's Court, London, E.C.3, and Port Fortin.

TRINIDAD

Name of field—	Year of discovery	No. of producing wells: Flowing	No. of producing wells: Pumping	Producing depth	Daily avg. production (bbl.)	Accumulated production to 7-1-49 (bbl.)	Wells drilling	Name and type of formation	Gravity °A.P.I.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Barrackpore	1918	12	33	500-10,000	1,300	7,214,000	1	Miocene sands	27°
Brighton	1910			700-3,000				Miocene sands	18°
Coora-Quarry	1936			1,200-6,500				Miocene sands	26°
Cruse	1913	22	67	2,000-4,000	2,040	15,340,000		Miocene sands	21°
Forest Reserve	1914	121	251	100-8,000	14,250	93,355,000	4	Miocene sands	24°
Fyzabad	1920			300-8,000				Miocene sands	24°
Guapo				1,500-5,700				Miocene sands	24°
Guayaguayare	1902	22	53	500-6,000	1,075	8,741,000	1	Miocene sands	31°
Morne Diablo	1936	3	21	2,500-4,000	320	2,280,000		Miocene sands	25°
New Dome			9	1,000-2,500	100	2,285,000		Miocene sands	26°
Quinam	1936	2	12	1,500-4,000	250	1,261,000		Miocene sands	31°
Palo Seco	1934		*24	1,500-5,000	450		1	Miocene sands	21°
Parrylands	1913			2,000-4,000				Miocene sands	26°
Penal	1935	50	37	1,300-8,900	6,950	14,352,000	2	Mio.-Oligocene sds.	23°
Point Fortin	1908	184	114	1,000-8,450	8,040	58,270,000	2	Miocene sands	20°
San Francique	1922		17	1,000-2,800	250	4,679,000			23°
Wilson	1918	7	29	500-3,500	1,375	3,373,000	1	Mio.-Oligocene sds.	21°
Total Trinidad					56,450				

*Total number.

Turkey

OIL-EXPLORATION work has been carried out for a number of years in Turkey by the government's Turkish Institute for Mineral Research. In 1948 commercial production was obtained from the Ramandag structures in the southeastern part of the country. Development of this area is now being carried out with three rigs. A small topping plant near the field handles some of the heavy asphaltic crude but much of the production continues shut in until a larger outlet is provided. The Turkish organization, Maden Tekik Ve Arama Enstitusu, is headquartered in Ankara.

TURKEY

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Ramandag	1948		4	4,400	*3,000	46,000	3	Upper Cret. lime	20°

*Potential

Venezuela

BOTH exploration and production dropped off sharply in Venezuela during the early months of 1949 largely as a result of the decline in the heavy-fuel-oil market. Activity has been stepped up considerably since, and production in September was back to an all-time high. In Western Venezuela, a number of deep wildcats have been drilled in search of the light-oil Cretaceous formations but no new producing areas of major importance have been found. In Eastern Venezuela a new field was discovered by Venezuelan Atlantic Refining Co. and Pancoastal Oil Co., S.A. on the Joseph Ruiz property east of Mercedes field, and farther east, Phillips Oil Co. continued to outline its new field west of Roble. Socony-Vacuum Oil Co. of Venezuela had an apparent new field discovery with its Morichi well in the Oficina area, and the same company continued active drilling in the Barinas discovery area in southwestern Venezuela. Leading Venezuelan operator is Creole Petroleum Corp., Apartado 889, Caracas, and in New York, 350 Fifth Avenue. Shell operates in Venezuela through three companies, Colon Development Co., Ltd., Venezuelan Oil Concessions, Ltd., and Shell Caribbean Petroleum Co., Ltd., all at Apartado 19, Maracaibo. Shell's London headquarters are at St. Helen's Court, Great St. Helen's, London, E.C. 3. Third major leading company in Venezuela is Mene Grande Oil Co., C.A. (Gulf), Edificio Vulcania (Apartado 109) Caracas. Other operators include: Socony-Vacuum Oil Co. of Venezuela, Apartado 246, Caracas, and in New York, 26 Broadway; Sinclair Oil & Refining Co., Maturin, Monagas, and in New York, 630 Fifth Avenue; Texas Petroleum Co., Apartado 267, Caracas, and in New York, 135 E. 42nd Street; Venezuelan Atlantic Refining Co., Apartado 893, Caracas, and in Philadelphia, 260 South Broad Street.; S. A. Petrolera Las Mercedes (Texaco and Ultramar), Apartado 1426, Caracas; Phillips Oil Co., Apartado 1031, Caracas, and in New York, 80 Broadway; and Richmond Oil Co., (Standard Oil Co. of California), Apartado 221, Caracas, and in San Francisco, 225 Bush Street.

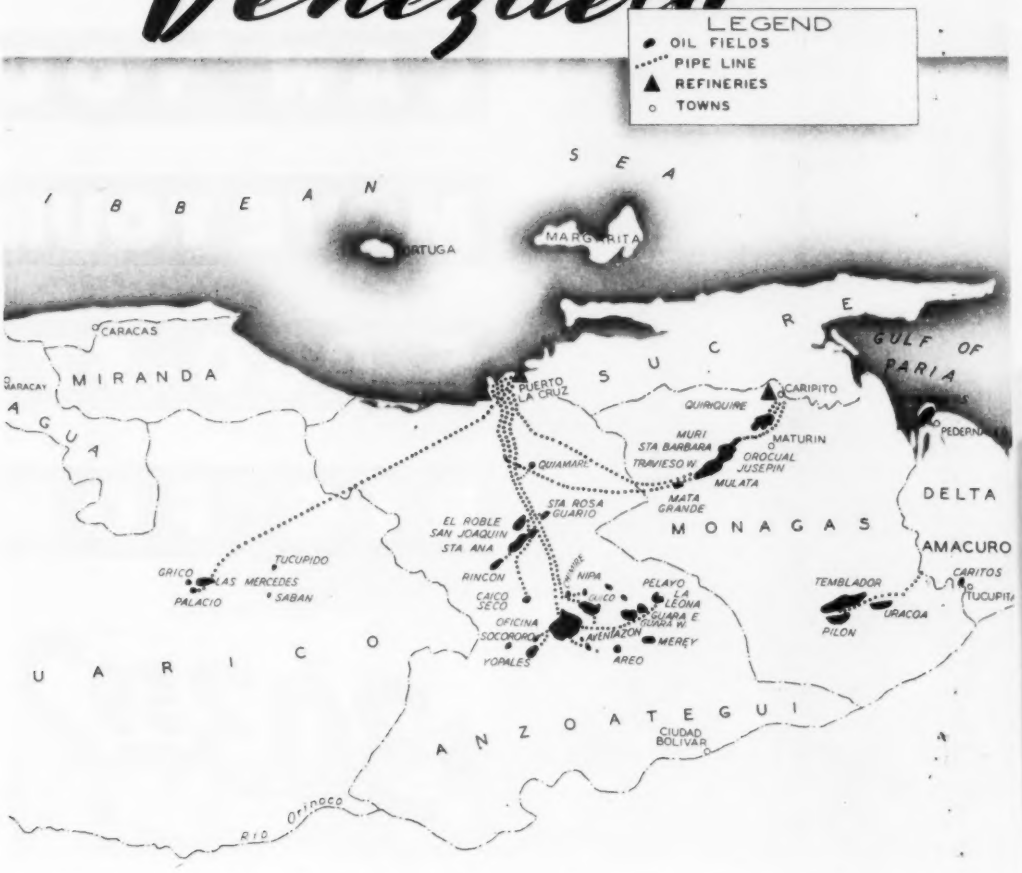
VENEZUELA

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Lagunillas	1926	290	1,430	3,001	354,900	1,703,583,969	10	Miocene-Eocene	17°-26°
Tia Juana	1928	229	675	3,001	144,800	573,564,278	3	Miocene-Oligocene	13°-26°
La Paz	1925	29	65	4,264	129,700	128,054,028	5	Eocene-Cretaceous	34°
Bachaquero	1930	596	77	3,444	72,400	140,877,701	7	Miocene	13°-15°
Cabimas	1917	220	994	2,198	63,900	597,343,520	5	Miocene-Oligocene	21°-25°

VENEZUELA (Continued)

Name of field—	Year of discovery	No. of producing wells: Flowing	No. of producing wells: Pumping	Producing depth	Daily avg. production (bbl.)	Accumulated production to 7-1-49 (bbl.)	Wells drilling	Name and type of formation	Gravity °A.P.I.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Guara	1942	374	5	4,920	60,100	122,437,168	2	Miocene-Oligocene	36
Quiriquire	1928	134	505	3,280	65,400	313,659,565	7	Pliocene	18
Mene Grande	1914	6	543	4,132	46,800	329,553,108	4	Eocene	16°-21
Oficina	1937	222	126	5,116	37,000	146,353,451	1	Miocene-Oligocene	32°
Mara	1945	28	1	5,248	74,100	41,906,755	13	Cretaceous	30°
Jusepin	1938	398	26	4,264	29,700	113,603,215	2	Miocene-Oligocene	32°
Santa Barbara	1941	241	75	5,641	20,800	69,770,950	1	Miocene	32°
Nipa	1946	170	2	7,544	32,100	19,095,944	14	Miocene	34°-39°
Mulata	1941	189	46	4,592	17,900	10,774,489	3	Miocene	33°
Guico	1944	93	10	6,068	11,600	22,997,062		Miocene	39°
El Cubo	1916	27	160	984	14,100	110,958,793	2	Eocene	33°-41°
San Joaquin	1939	84	1	6,560	10,400	27,385,744	1	Miocene-Oligocene	44°
Temblador	1936	104		3,804	10,300	30,099,907		Miocene-Oligocene	21°
Las Mercedes	1942	162	2	4,264	15,300	5,441,402	7	Mio.-Olig.-Cret.	29°
Guario	1940	42		5,248	6,200	10,438,877		Miocene-Oligocene	44°
Tucupita	1945	40		5,608	5,100	5,047,314		Miocene	16°
Leona	1938	36	7	5,904	4,900	9,767,684		Miocene-Oligocene	28°
El Roble	1939	31		9,446	4,900	16,251,006	4	Miocene-Oligocene	53°
Cumarebo	1931	56	28	1,968	3,900	20,415,807		Miocene	47°
Pueblo Viejo	1940	27	9	1,968	800	8,542,369	1	Eocene	18°-20°
La Concepcion	1935	7	137	3,148	3,700	33,116,736		Eocene	36°
Tucupido	1946	30		5,576	8,700	2,628,233	7	Miocene	41°
Santa Rosa	1941	17		7,380	3,400	5,235,804	2	Mio.-Olig.-Eocene	44°
Pedernales	1933	14		1,571	5,400	11,160,129	1	Miocene	21°
Rincon Largo	1936	4		7,708	1,800	3,466,335		Miocene-Oligocene	43°
Mata Grande	1946	21	1	4,592	1,700	1,149,223		Miocene-Oligocene	27°
Yopales	1937	21	6	4,165	2,700	2,186,797	2	Miocene-Oligocene	21°
Santa Ana	1936	9		8,265	2,600	2,013,868	2	Mio.-Olig.-Eocene	39°
El Toco	1948	7		7,544	2,300	716,768	2	Eocene	43°
Fria	1948	6	2	5,576	600	533,121		Miocene	36°
Boscan	1947	1	38	9,982	11,500	863,631	3	Oligocene-Eocene	10°
Hombre Pintado	1927	2	47	1,968	700	1,120,787		Oligocene	24°
Chimire	1948	42		754	19,400	1,678,432	10	Miocene-Oligocene	24°
Caico Seco	1946	7		6,560	1,300	449,009	1	Miocene-Oligocene	43°
Mene Mauroa			181		300	24,757,234			33°

Venezuela



(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Netick	1929	1	6	8,268	200	58,199		Eocene	29
Merey	1934	6		4,493		263,463		Pleistocene	18
Sibucara	1948	1		13,451	7,500	1,073,186		Cretaceous	36
La Ceiba	1945	1		7,872	200	200,157		Oligocene	36
Pelayo	1947	4		820	300	149,575		Miocene-Oligocene	40
Quiamare	1942	2		6,396	100	672,727		Miocene-Oligocene	38
Saban	1948	9	4	5,718	300	79,791		Miocene-Oligocene	34
Silvestre	....	....	2	9,763	100	.....		Eocene	24
Areo	....	1	....	.....		40,248			17
Pirital	1945	....	1	2,460	100	83,232		Miocene-Oligocene	30
Los Caritos	1939	....	1	5,641	....	255,903		Miocene-Oligocene	30
San Jose	1948	1	....	.....	....	7,434			12
El Menito	1924	1	....	.....	....	6,705		Younger Tertiary	15
Ensenada	1948	1	....	.....	....	9,164	2		44
San Roque	1949	....	....	.....	700	205,277	5		
Ruiz	1949	8	....	4,450	100	2,728	2		
Total Venezuela		4,055	5,213		1,313,200	4,692,083,002	131		

Yugoslavia

YUGOSLAVIA is attempting to develop sufficient production to meet at least domestic requirements. Its 5-year plan calls for a production of about 500,000 tons (about 10,000 bbl. daily) in 1951, most of which will come from Levanda field northeast of Zagreb on the Hungarian border.

Yugoslavia's break with other Communist countries in Eastern Europe has shut off previous supply sources of products as well as production equipment.

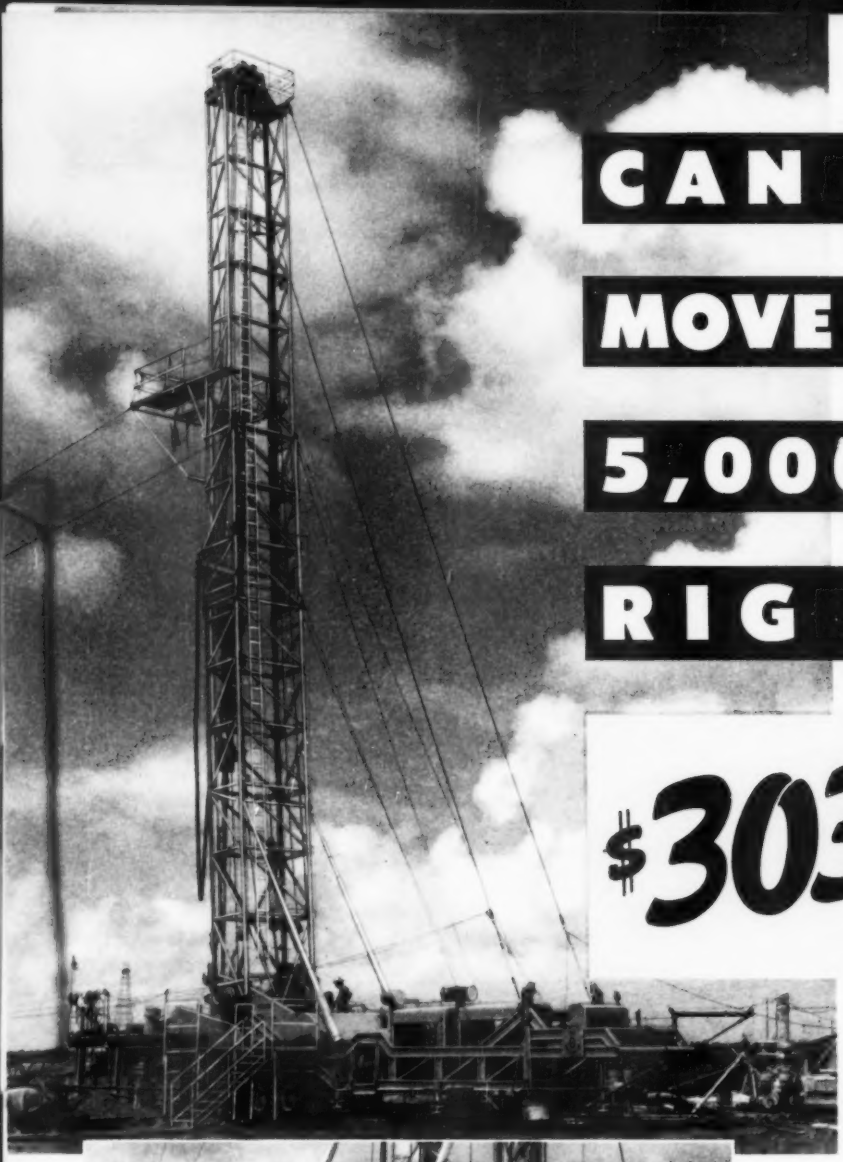
Besides Levanda, the Yugoslavs are reported to have found oil in the Korenica district in southwestern Croatia. A recent report places the reserves of the Hungarian border field at 14,000,000 tons (about 100,000,000 bbl.). The Yugoslav industry was nationalized in 1946. It is now controlled by Generalna Direkciji Za Naftu I Plin, Ministarstvo Rudarstva. The address is Karabjordjeva 48, Beograd (Belgrade).

YUGOSLAVIA*

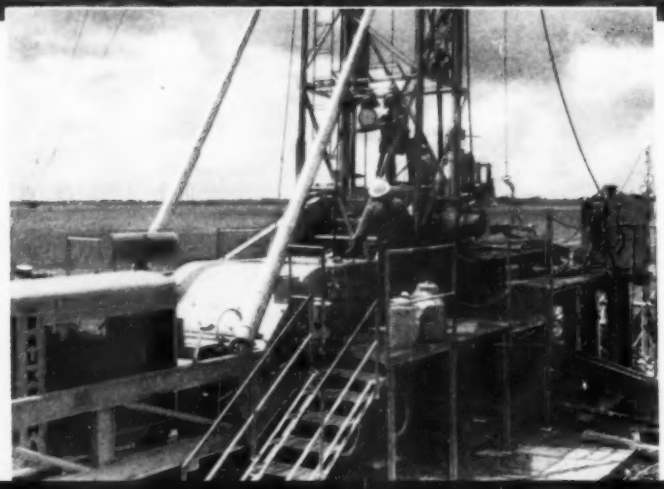
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Peklenco-Selencia	1942			4,000-4,200					

*Communist dominated, no current data available.

CAN YOU MOVE YOUR 5,000-FT. RIG FOR $303.59?



The Trailerig is a complete double drum draw works with a 90-foot mast, for drilling to 5,000 feet with 4½-inch pipe or workover jobs to 10,000 feet.



The Trailerig is arranged for maximum operating convenience. Driller's position at the centralized air controls provides excellent visibility. The cathead is placed in front of the driller for maximum safety. 64 or more inches of wellhead clearance is provided under the rotary table without the use of bulky, hard-to-move ramps.

Invoice

DON W TRUCK LINE

OIL FIELD HAULING

DAY PHONE 1948

PORT LAVACA HIGHWAY ✣ NIGHT PHONE 2237-J

P. O. BOX 711

VICTORIA, TEXAS

OUR INVOICE NO. Nº 2914

DATE Sept. 24, 1949

STATE-WIDE R. R. C. NO. 5600

I. C. C. PERMIT NO. MC-85652

YOUR ORDER NO.

LEASE Welder-Mecom

THIS WORK ORDERED BY YOUR MR.

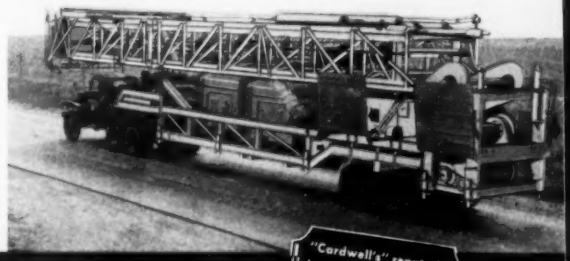
Big Six Drilling Co.,
214 Oil & Gas Bldg.,
Houston, Texas.

DATE	DESCRIPTION	HOURS	RATE	AMOUNT
9/20-21/49	Tear Down, move and set-up your Rig from Welder-Mecom #1 to Welder-Mecom #2. Pull water well and haul tool from your rig at Bloomington, to your rig Welder-Mecom #2 and haul tools from your rig to D& W Tool Co. in Victoria.			
	One 20 Ton Tandem W/ Driver & Helper	5	16.25	81.25
	One 8-10 Ton Truck W/ Driver & Helper	3	10.75	32.25
	Two 2½ Ton trucks W/ Drivers & Helpers	29	6.25	181.25
	3% Federal Tax			8.84
				303.59

BIG 6 DID!!

This "Cardwell" 5,000-foot Trailerig, owned by Big 6 Drilling Company, has been making records for low-cost, quick moves in the Gulf Coast. The invoice above covers the total paid-out expense for a typical five-mile move. . . . Low-cost moving combined with fast rig-up time cut costs to the "bone," and keep the Trailerig making hole more days per month. Other Trailerig owners in the United States, Canada and foreign fields are reporting huge savings in moving costs. This high performance "Cardwell" Trailerig can cut your moving costs to a minimum. Ask your "Cardwell" representative where you can see a Trailerig at work.

Moving is simple. The Trailerig is only 8 feet wide, 13½ feet high, and can be easily moved with a fifth-wheel type truck.



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Foreign Pipe-Line Mileage Increased By 2,650 Miles During 1949

by Paul Reed
Pipe Line Editor

FOREIGN pipe-line projects completed and put into operation during 1949 totaling 2,650 miles indicate the upward world-wide trend in construction operations which will become more apparent in 1950 when pipe laying will be on even a larger scale both here and abroad.

While the Middle East pipe lining has been outstanding in 1949, it appears that Canadian construction will be predominant in foreign activities during 1950. Meanwhile the large Middle East program covering several years will be going forward.

An important Middle East development last summer was the putting in operation of the Iraq Petroleum Co., Ltd., 532-mile, 16-in. crude-oil line from Kirkuk, Iraq, to Tripoli, Lebanon, which started with a throughput of 40,000 bbl. daily. The 150-mile, Kirkuk-Haditha section of this line was originally laid for the I.P.C. 620-mile, 16-in., planned for the Kirkuk-Haifa, Palestine, project which was shut down in 1948 before completion because of the Iraq Government's refusal to let Iraq oil go into Israel territory.

Trans-Arabian Pipe Line Co. (Tapline) has already laid more than 360 miles of 30 and 31-in. pipe which amounts to more than a third of the 1,067-mile, Abqaiq-Sidon project. At the northwest end of the route, Williams Brothers Corp. has reestablished a base at Beirut in preparation for resuming construction operations which had to be abandoned during hostilities last year. International Bechtel, Inc., has had a construction organization working for the past 2 years at the southeast end in Saudi Arabia.

Kuwait Oil Co. has had under construction a 600-mile gathering system in Kuwait. Anglo-Iranian Oil Co., Ltd., completed its 56-mile, 20-22-in. Agha Jari-Mashur, Iran, line in March for 100,000 bbl. daily throughput.

Middle East Pipelines, Ltd., will start construction of its 800-mile, 34-36-in., Iran-Levantine line either immediately following or somewhat before Tapline's completion. Later I.P.C. will build the Kirkuk-Banias, Lakatia, 30-in. Lakatia is a country just north of Lebanon. While Kuwait Oil Co. (Gulf and Shell) has planned for a big-inch line from Kuwait to the Mediterranean, there have been reports this year of Kuwait's negotiations for

Projects Planned, Authorized, or Under Construction

TABLE 1—PRINCIPAL FOREIGN CRUDE-OIL PIPE-LINE PROJECTS

Company	Miles	Diam. (in.)	Status	Contractor, location, completion date
Cia. de Petroleo Ganso Azul, Ltda.	48	4	Planned	Ganso Azul field to Pucallpa on Upper Ucayali River, Peru.
Direccion General de Yacimientos Petroliferos Fiscales	25		Under way	Tupungato-Lujan de Cuyo, Argentina.
Direccion General de Yacimientos Petroliferos Fiscales	409		Under way	Plaza Huincul-Bahia Blanca, Argentina.
Direccion General de Yacimientos Petroliferos Fiscales	10		Under way	Lujan de Cuyo-Agrelo.
Interprovincial Pipe Line Co.	1,150	16-18-20	Planned	Edmonton, Alta., to Superior, Wis. Contracted: Canadian-Bechtel, Ltd., and Fred Mannix Co., Edmonton-Regina, 450 mi., 20-in.; Williams Brothers Corp., Regina-Gretna, Man., 340-mi., 16-in.; Anderson Brothers Corp., Minnesota and Wisconsin, 360 mi., 18-in., 10-50.
Iraq Petroleum Co., Ltd.*	620	16	Under way	Kirkuk to Haifa, Palestine.
Iraq Petroleum Co., Ltd.	556	30	Planned	Kirkuk, Iraq, to Banias, Lakatia, 1952
Kuwait Oil Co. (Gulf and Anglo-Iranian)	1,100	30	Planned	Kuwait, Arabia, to Levantine Port.
Kuwait Oil Co. (Gulf and Anglo-Iranian)	600	4-30	Under way	Bechtel-Kuwait, Arabia.
Middle East Pipelines, Ltd.	800	34-36	Planned	Iran-Levantine Port.
Montreal Pipe Line Co., Ltd.	68	18	Planned	Fred Mannix & Co., Ltd., loop in Quebec, 1950
Petroleos Mexicanos	145	$12\frac{3}{4}$	Considered	Reynosa to Monterrey, Mexico.
Petroleos Mexicanos	280	$12\frac{3}{4}$	Authorized	Poza Rica to Salamanca, Mexico.
Santos Jundiai Railroad	30	18	Planned	Santos to Sao Paulo, Brazil.
Trans-Arabian Pipe Line Co.	1,067	30-31	Under way	International Bechtel, Inc.-Williams Bros. Corp.-Graver Tank & Mfg. Co.-Chicago Bridge & Iron Co.-Abqaiq, Saudi Arabia, to Sidon, Lebanon.
Yacimientos Petroliferos Fiscales de Argentina	400		Planned	Plaza Huincul to Bahia Blanca, Argentina.

*Construction shut down.

TABLE 2—PRINCIPAL FOREIGN PRODUCTS PIPE-LINE PROJECTS

Company	Miles	Diam. (in.)	Status	Contractor, location, completion date
Cia. des Pipe Lines Petroliers Francias*	150	10	Planned	Le Havre to Paris, France.
Columbian Ministry of Petroleum	90	6	Planned	Puerto Berrio-La Dorada, Colombia.
Columbian Ministry of Petroleum	103	4	Planned	Puerto Berrio-Medellin, Colombia.
Columbian Ministry of Petroleum	75	4	Planned	Buena Ventura-Cali, Colombia.
Creole Petroleum Corp.	10	8	Authorized	Catia de la Mar to Nueva Caracas, Venezuela
Northern Pipe Line, Ltd.	400	10	Under way	Montreal, Que., to Toronto, Ont.
Petroleos Mexicanos	160	$10\frac{3}{4}$	Authorized	Minatitlan to Salina Cruz, Mexico.
Santos Jundiai Railroad	30	10	Planned	Santos to Sao Paulo to Compinas, Brazil.
Svenska Enterprenad Aktiebolget	220		Planned	Uddevalla to Vasteras, Sweden.

*Deferred.

TABLE 3—FOREIGN NATURAL-GAS PIPE-LINE PROJECTS

Company—	Miles	Diam. (in.)	Status	Contractor, location, completion date
Azienda Generale Italiana Petroli			Under way	Lodi-Milan, Italy.
Azienda Generale Italiana Petroli			Under way	Lodi-Turin, Italy.
Azienda Generale Italiana Petroli			Under way	Lodi-Genoa, Italy.
Direccion-General de Gas del Estado	310		Planned	Plaza Huincul to Neuquen, Argentina, to the vicinity of General Conesa, Argentina.
Direccion General del Gas del Estado	62		Under way	Comodoro Rivadavia-Caleto Olivia, Argentina.
Northwest Natural Gas Co.	950	24	Planned	Alberta fields to Vancouver, B. C., Seattle, Wash., and Portland, Ore.
Petroleos Mexicanos	205	16	Considered	Monterrey to Torreon, Mexico.
Petroleos Mexicanos	260	20	Considered	Monterrey-Tampico-Poza Rica area, Mexico.
Petroleos Mexicanos, Mexican Gas Co., and Industrial Gas Co.	600		Planned	Reynosa, Tamaulipas, to Mexico City, D. F., Mexico.
U.S.S.R. (reported)	360		Under way	Dashiva (in Carpathians) to Kiev, Ukraine.
Westcoast Transmission Co., Ltd.	1,400	30	Planned	North Alberta, Vancouver, B. C., and northern California.
Western Pipe Lines	710	22-24	Planned	Alberta fields, Saskatoon, Alta., to Winnipeg, Man., Canada.

Completed Projects

TABLE 4—PRINCIPAL FOREIGN CRUDE-OIL PIPE-LINE PROJECTS

Company—	Miles	Diam. (in.)	Contractor, location, completion date
Anglo-Iranian Oil Co., Ltd.	56	20-22	Agha Jari to Mashur, Iran.
Corporación de Fomento de Chile	45	8	Cerro Manantiales (Springhill) to Caleta Clarencia Techint Pipe Line Div., Tecnica International, S. A. (on Bahia Gente Grande).
Direccion General de Yacimientos Petroliferos Fiscales	10		Tupungato-Anchoris, Argentina.
Imperial Oil, Ltd.	85	4-8	Sparling-Davis Co., Ltd.—Redwater and Deron, Alta., Canada.
Iraq Petroleum Co., Ltd.	532	16	Kirkuk to Tripoli, Lebanon.
Iraq Petroleum Co., Ltd. (Petroleum Dev. [Qatar], Ltd.)	73	13-14	Dukhan to Umm Said.
Pancoastal Oil Co., C. A.	24		Jose Ruiz-3—Concession to Tucupido, Venezuela.
Yacimientos Petroliferos Fiscales de Bolivianos	255	6	Camiri-Cochabamba-Sucre, Bolivia.

TABLE 5—FOREIGN PRODUCTS PIPE-LINE PROJECT

Company—	Miles	Diam. (in.)	Contractor, location, completion date
United Kingdom Government	150	6	Shell Petroleum Co. supervision Mtwara, near Lindi, to Ground Nuts area, Tanganyika, Africa.

TABLE 6—FOREIGN NATURAL-GAS PIPE-LINE PROJECTS

Company—	Miles	Diam. (in.)	Contractor, location, completion date
Azienda Generale Italiana Petroli		10	Po Delta—Venice, Italy.
Direccion General del Gas del Estado	37		La Plata—Buenos Aires, Argentina.
Direccion General del Gas del Estado	37		Tupungato—Mendoza, Argentina.
Direccion General del Gas del Estado	62		Internos de los Yacimientos, Argentina.
Direccion General del Gas del Estado	1,000	10	Tecnica and government crews—Comodoro Rivadavia—Buenos Aires, Argentina.
Petroleos Mexicanos	150	20	Williams Bros. Co.—Poza Rica to Mexico City.
Regie Autonome des Petroles	114	6	Toulouse—Bordeaux, France.

using Tapline facilities. Such an arrangement would eliminate the building of the large contemplated Mediterranean outlet.

When the entire Middle East program is finished probably not before 1957, the capacity of all pipe-line facilities for delivery at Mediterranean ports will total 1,700,000 bbl. daily.

Lines to be built in 1950 to serve Canada total 1,718 miles, including 526 miles in sections extending across the border into the United States. These include the Interprovincial Pipe Line Co., Edmonton, Alta.-Superior, Wis., 1,150-mile 16-18-20-in. crude-oil line with 790 miles in Canadian territory; the Northern Pipe Line Co., Montreal-Toronto, 400-mile, 10-in. products line; and the Portland-Montreal crude-oil looping consisting of 234 miles of 18-in. pipe of which 68 miles will be laid by Montreal Pipe Line Co., Ltd., in the Province of Quebec while the remainder will be laid in New England states.

Large natural-gas lines proposed as outlets from Western Canada to the United States have been delayed by action of the government of the Province of Alberta.

Two rival companies promoted by United States interests are seeking government authorization for natural-gas pipe lines from Alberta to the United States. These are Northwest Natural Gas Co., and Westcoast Transmission Co. In addition a Canadian group is planning Western Pipe Lines, Ltd., to transmit Alberta gas to Winnipeg. These three lines represent investments totaling $323,000,000 for constructing an aggregate of 3,060 miles.

The longest foreign natural-gas line put into service in 1940 is the 1,000-mile, 10-in., Comodoro Rivadavia-Buenos Aires, Argentina, project of Dirección del Gas del Estado. Probably the most difficult pipe-line undertaking has been the 225-mile, 6-in. Camari-Cochabamba-Sucre crude-oil line in the mountains of Bolivia completed this year by Yacimientos Petroliferos Fiscales de Bolivianos. Petroleos Mexicano finished a 150-mile, 20-in. gas line to Mexico City.

In Africa the British Government has completed the longest foreign products line put in operation in 1949. This extends from the east coast to the Tanganyika Ground Nuts area.

Most of the 1949 pipe-line construction in Europe has been for natural-gas lines in France and Italy. Plans are reported for extensive future products lines in France.

The accelerated pace of pipe-line construction for petroleum and natural-gas lines abroad promises to make important contributions to world-wide economic development by providing economical fuel transportation.

At this time foreign projects under way have a total of 3,780 miles. Projects planned for the future total approximately 8,350 miles of which 3,500 miles are for crude-oil lines, 850 miles for products, and 4,000 miles for natural gas.

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Wildcatting in Saudi Arabia

(Continued from page 146)

supported by large pneumatic tires, and rapidly hauled by truck to any desired new location, where it can again be set on a simple foundation in a matter of hours. One of the interesting sights of Aramco operations is a house elevated some 6 or 8 ft. from the ground, rolling across the desert at 20 miles per hour.

The Aramco wildcat camp is a natural development of the portable-house idea and fits logically into the early phases of a field's development. If a dry hole should be drilled (a result that Aramco has been able to avoid for nearly 6 years), the camp can be moved easily to the next prospect. If oil is discovered, the camp will continue to function as a base of operations in that field until development has progressed to the point where plans for permanent installations can be made intelligently.

The portable wildcat camp consists of four units, all having rectangular floor dimensions. Three of the units measure 32 by 40 ft.; the fourth is 33 ft. square. The interiors of these units vary markedly. Two are dormitories, each containing five rooms together with toilet and bath facilities. Normally 2 men occupy each room permitting accommodations for about 16 men, as one room is reserved for the foreman's office, and another for a laboratory for geologist and petroleum engineer. The normal wildcat camp arrangement places these dormitories on either side of a unit containing a kitchen and a combination dining hall and recreation room. A large trailer-mounted refrigeration unit is set close beside the kitchen door. The dining hall-recreation area is divided about equally between dining facilities and card tables, raido, easy chairs, and magazine and book space.

In the rear of these three buildings stands the utility unit, the heart of the camp's comfort. This 33-ft.-sq. building consists of steel walls, roof, and floor and usually contains:

Two 60-kw. diesel-driven, or one 175-kw. twin diesel-driven generator.

Air-conditioning unit capable of maintaining a temperature of 72° F. in the living portion of the camp while the temperature rises to 120° F. shade temperature outside.

One water-distillation unit capable of treating about 90 gal. per hour.

One water pump with a capacity of 3,000 gal. per hour to supply toilets, kitchen, showers, laboratories, etc.

One heating unit which operates by conducting water through an exchanger placed around the exhaust on the diesel engines. The same system that circulates cold water for cooling the buildings in summer cir-

culates hot water for warming them in winter.

Two small air compressors for general service.

Miscellaneous small pumps, transformers, switch panels, etc.

The generator supplies power not only for lights, but for all other electrical requirements such as refrigeration, water coolers, etc. The distillation unit is required only when the local water supply is brackish, a common experience in eastern Saudi Arabia.

The crowning glory of the utility layout, from the standpoint of the men who do the work, is the air conditioning. Gone are the old rigors of the wildcatter in Saudi Arabia. He now may drink distilled water, if the local supply is unsatisfactory, from a refrigerated drinking fountain. He now has his food brought to him by plane or, in some cases, by refrigerated truck, and held in refrigerated storage. Best of all, after a hot tour on the rig, he takes his shower and relaxes in an air-conditioned room.

The drilling equipment used in Aramco's wildcatting operations is identical with that employed in normal field development. Aramco has endeavored to group its drilling equipment into large units in order to achieve quick and economical transportation between well sites. The same grouping has been, or is being, applied to wildcatting operations. When the present unitizing program is completed, Aramco's rigs (all diesel-engine operated) will consist of three major and about five minor units, all portable. The three major units are:

A 136-ft. standard derrick mounted on an 11½-ft. subbase.

A draw-works engine unit consisting of (1) draw works good for drilling to over 10,000 ft., (2) a hydraulic or dynamatic brake, (3) three six-cylinder, 260-hp. diesel engines, and (4) transmission equipment usually including fluid couplings, all mounted on a common subbase.

A mud-pump unit including (1) a main 7¾ by 18-in. pump (which takes its power from the engines on the draw-works unit), and (2) an auxiliary 7¾ by 16-in. pump, and eight-cylinder 350-hp. diesel-engine drive, (3) a 6 by 5 by 30-ft. mud suction tank, (4) a 50-bbl. crude-oil tank, and (5) a 5,000-gal. diesel-fuel-oil tank.

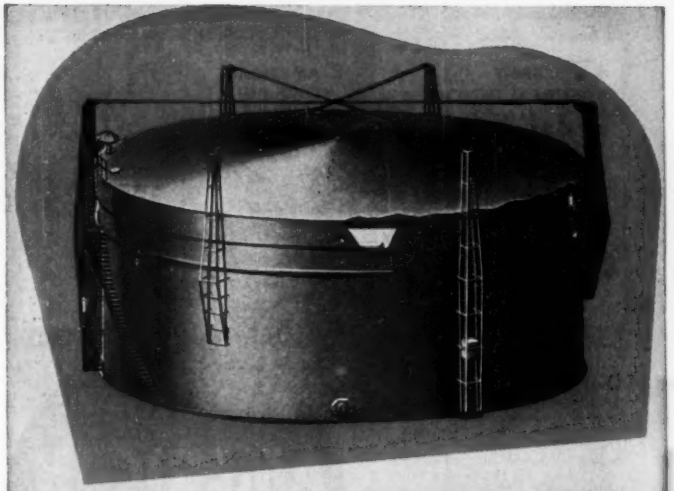
The auxiliary units consist of:

Two 500-bbl. bolted steel tanks and pipe connections for mud storage, mounted on a steel framework.

A generator plant and work shop housing two 25-kva. diesel-electric generators and auxiliary equipment.

A 6 by 5 by 27-ft. mud-settling tank on which are mounted the shakers, the dog house, and a 100-bbl. water-circulating tank for hydraulic couplings and brake rims.

Still to be constructed are auxil-



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iary units to consist of (1) the walkway and folding casing racks, and (2) an elevated mud-mixing platform.

This rig is rated as being capable of drilling efficiently to 10,000 ft. plus. In practice, Aramco operators have found no handicaps in using the equipment to the maximum depth drilled to date, between 11,000 and 12,000 ft.

The key to all movement of these groupings of equipment lies in the pneumatic-tired dolly and the 100-ton pneumatic jacks. The drilling men say these jacks can lift anything which can be separated from the earth, and that the dollies can carry anything the jacks can lift. The boys should be pardoned for a slight exaggeration. Each of the three major units, weighing between 100 and 120 tons, is transported by identical dollies arranged to give three-point suspension, one dual dolly being placed in front, and two single dollies on either side near the rear. The front dolly carries sixteen 14.00 by 20 tires and supports its load through a ball and socket which permits steering. The two rear dollies have eight tires each and, in general, take approximately half the load between them. The dual front dolly has a capacity of 60 tons; each rear dolly can support 30 tons. The single rear dollies also are used in conjunction with heavy tractors, in moving the various auxiliary units.

All dollies are designed to permit full oscillation. This has a great advantage in transporting units over rough terrain. It permits uniform distribution of the load at all times to all tires—an important feature under conditions of heavy loading on irregular and sandy surfaces. In order to traverse the loose desert sand, tire inflation is limited between 22 and 32 psi. The looser the sand, the softer must be the tires to permit them to spread and further distribute their load.

A few notations regarding the individual units and their relationship with each other may be of interest. The derrick is given stability during moving by placing the rear dollies on brackets extending on either side of the subbase. This arrangement supports the derrick on three points placed 40 ft. apart. The derrick substructure provides sufficient clearance for pulling the equipment over a standard christmas tree. All operating equipment remains rigged in the derrick while it is being moved. Blocks, lines, rotary table, and tongs all remain in place and are rigged and ready to function when the derrick is spotted at the new location.

While the derrick is mounted on a subbase 11½-ft. high, the subbase of the engine draw-works unit rises only 7 ft. 3 in. The floor level of the latter unit is brought slightly above the level of the derrick floor by placing the subbase on a series of steel saw horses. The draw-works

side of the derrick substructure is cut back sufficiently to permit the draw-works engine unit to slide into the derrick a sufficient distance to give adequate clearance between derrick members and the drilling line when it is operating off the drum of the draw works.

No subbase is provided for the mud-pump unit, the steel base being placed at ground level when the pumps are in operation. The main mud pump is connected to the pulley on the drilling engine compounded by V-belts.

With the equipment described above, Aramco operators have been able to move their drilling units over the rolling sandy terrain of the desert with little difficulty. The sand dune itself has proved no barrier to movement. The power required to pull even the heaviest unit is relatively low. One 130-hp. track-type tractor handles it satisfactorily on a sandy level surface. A second tractor is used on grades and through loose sand.

Rig Foundations

Another feature of Aramco's drilling practice which may also be a feature of wildcat drilling, is the minimizing of rig foundations. Wells habitually are drilled on sand dunes or on other accumulations of loose sand ranging up to 100 ft. in depth Aside from the concrete lining of a shallow cellar, no permanent foundation is installed. The sand is leveled and a mat of 3-in. planks is laid to cover the area required for the derrick, engine draw works, and mud-pump units. Two layers of planking are adequate. On this mat, the three major units are spaced. Their weight provides all the stabilization required. No difficulties have been encountered through shifting or vibration of these parts.

It also may be of interest to note that Aramco operators no longer hesitate to drill with rotary and a good quality mud through this "snow bank" of sand on which the derrick rests. They have found that if the hole is drilled quickly, and conductor pipe carefully cemented into the underlying rock, the danger of sand washing away and undermining the rig foundation is eliminated. If, throughout the drilling operation, care is exercised to conduct all liquids away from the immediate vicinity of the foundations, no troubles develop from settling or shifting of the rig.

Aramco drilling men strongly suspect that the ultimate in rig unitization for desert operation has not been reached. The company recently received a shipment of 36.00 by 40 tires. Each of these monsters, standing about 9 ft. high, can carry 100,000 lb. at slow speed. Six of them would be capable of supporting the entire drilling rig, including derrick, draw works, engines, pumps, and auxiliary equipment. As yet, the engineers have not designed the structure to carry this drilling unit.

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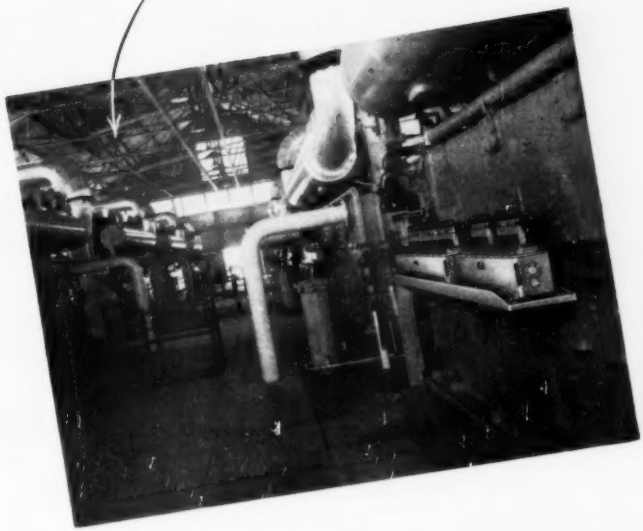

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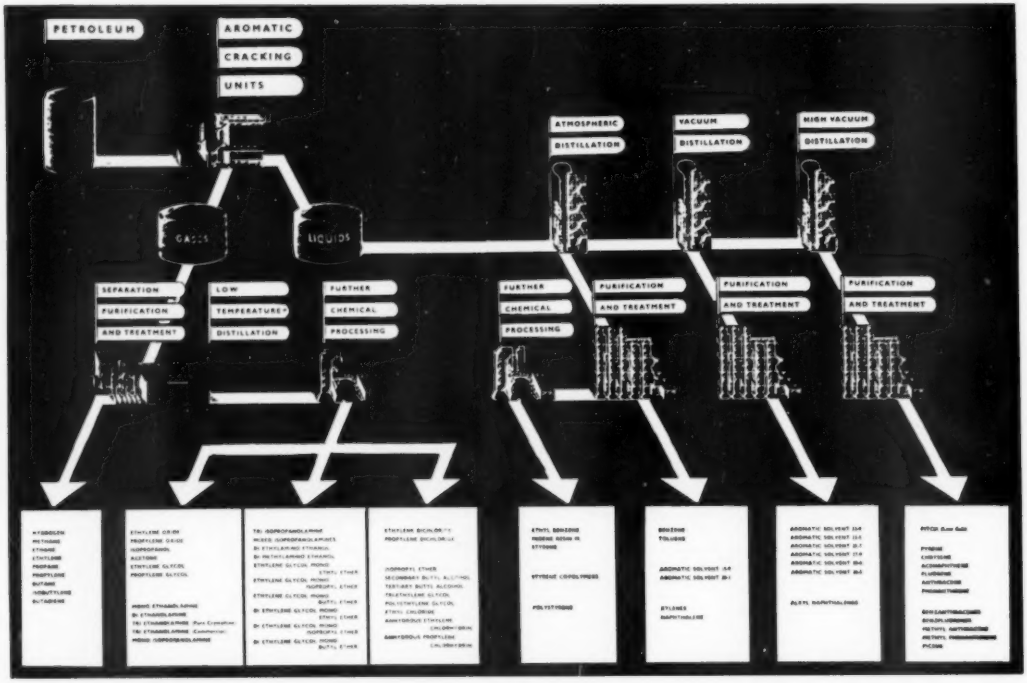

Wide range of petroleum-derived chemicals will be manufactured at

Britain's New Petrochemical Plant

OUTSTANDING among the £93,000,000 worth of petroleum-refining and chemical plants projected, authorized, or under construction in Great Britain, is the £4,500,000 petroleum-chemicals plant of Petrochemicals, Ltd., at Partington near Manchester. The plant is now almost completed, the first units being already in operation. The speed with which the project has been pressed forward—in spite of the many obstacles in the way of rapid construction in Britain at the present time—will be appreciated when it is recalled that site clearance began just over 3 years ago.

A wide range of petroleum-derived chemicals will be produced by this plant. An idea of the scale of production may be gathered from the fact that the initial throughput of naphtha or gas-oil charging stock is some 90,000 to 100,000 tons per annum, while provision has been made for substantial future increases in capacity. The direct and indirect dollar earning—or, rather, saving—capacity of the completed plant has been estimated at some $8,000,000 annually. Already cracker gas is being supplied to Manchester Gas Corp.'s Partington works at a rate which will effect a saving of £250,000 capital expenditure on gas-works plant and some 53,000 tons per year of coal.

Site for the plant comprises 750 acres of land, bounded to the north by the River Mersey and to the west by the Manchester Ship Canal. The plant of Petrochemicals, Ltd., occupies 120 acres in the center of the estate, and, of the remaining land, part has been set aside for welfare, housing, and similar purposes, while the major portion will be available as sites for the erection of chemical plants utilizing the products of the Petrochemicals plant—in particular the olefinic gases, whose economic utilization depends largely on the elimination of long-distance transport.

Production of a wide range of aromatics and olefins simultaneously by one plant is made possible by the Catarole process—the starting point from which the whole Petrochemicals, Ltd., project has been developed. The products—the majority of which will be marketed under the trade name Catarex—fall into two main groups: (1) pure aromatics, aromatic solvents, and aromatic derivatives; and (2) derivatives of the olefinic gases such as ethylene and propylene oxides and glycols, isopropanol, acetone, etc.

Development of Catarole Process

The Catarole process is based upon an invention made by Dr. Ch. Weizmann and his team of collaborators led by Dr. E. Bergmann. By 1940, laboratory results had advanced sufficiently far to warrant the erection of a pilot plant, and Manchester Oil Refinery, Ltd. (of which H. S. Ebben is the chairman and Dr. F. Kind and Dr. G. Tugendhat are managing directors), decided to take up the process. H. E. Charlton was put in charge of the engineering-development work and Dr. Hans Steiner was made responsible for the chemical research.

Apart from the problem of designing and developing a new type of cracking furnace, many other prob-

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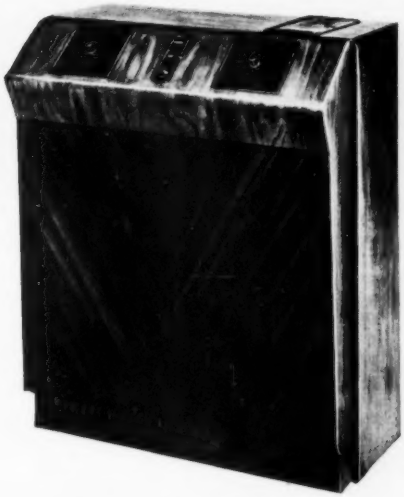

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lems had to be solved. Foremost among such problems were the separation of the gases and their subsequent conversion into liquids; the azeotropic distillation of the benzene, toluene and xylene fractions; and the engineering of completely original plants and their components.

Petrocarbon, Ltd.

In 1945, it was decided to give a separate entity to the team which was responsible for this work and a company was formed under the name of Petrocarbon, Ltd., with Dr. Kind and Dr. Tugendhat as managing directors and Brig. R. A. Hamlyn as chairman. The nucleus staff was gradually increased to take care of the formidable task presented by the erection of the Catarole plant and its ancillary units. Petrocarbon, Ltd., concentrates on research, design, engineering, economics, and the study of markets and international relationships.

Many members of the Petrocarbon team, but in particular the management and key personnel, have been closely connected with the erection of numerous oil refineries on the Continent (including "Aquila" S. P. A. T. I. at Trieste and the Albatros S.A. Belge refinery at Antwerp) and also the refinery of Manchester Oil Refinery, Ltd., England.

The successful completion of the Petrochemicals plant in such a short time must be regarded as a major achievement. Petrocarbon, while remaining closely associated with Petrochemicals, Ltd., and Manchester Oil Refinery, Ltd., is available as an independent design and development company, providing manpower and brains for research, development, design, supervision of construction, initial operation, and management of processes and plants, including complete refineries and chemical plants.

Full-Scale Operations in 1949

At the beginning of 1949 the first units of the plant came into operation, and all the main units will be working before the end of this year. These main units will have been completed at a cost of some £4,300,000.

It is perhaps appropriate to remark at this point that, shortly after construction of the plant had begun, the eventual success of the project appeared so certain that considerable expansion of the scheme was decided on even at that early stage. As a result, the capacity of the plant is now 90,000 to 100,000 tons per year as against the 50,000 tons originally planned.

Plant at Partington

The Petrochemicals plant is grouped into units as follows:

Aromatic catalytic cracking plant.—This comprises five Catarole cracking furnaces. Naphtha, kerosine, or gas-oil charging stock is fed direct to the furnaces where it is subjected to a low-pressure, high-temperature vapor-phase catalytic cracking process. There is a transformation into a gas fraction rich in olefins and an almost completely aromatic liquid free from sulfur. (All sulfur present in the charging stock is converted into H_2S.)

Azeotropic distillation unit, left, and atmospheric-vacuum distillation plant, right

The Catarole cracking plant is the nucleus and basis of the whole project. The furnaces are averaging 60 to 75 tons per day throughput and are in continuous operation for 3 to 4 months at a time. Fuel-oil requirements are about 10 per cent by weight of the charging stock.

Gas-purification plant.—Here the gas yield from the cracking plant is scrubbed with caustic soda, in scrubber towers of the conventional type, to eliminate sulfur.

Gas-separation plant.—In this unit the purified cracker gas—which is virtually free from acetylene—is separated into its constituent olefins and a hydrogen-methane tail gas. The method employed by Petrochemicals, Ltd., is low-temperature, low-pressure distillation.

The underlying principles are simple, but elaborate equipment is required to carry out the process economically and never before has it been employed for such a diversity of bases on so large a scale. Temperatures as low as —250° F. are employed and all the gases are liquefied except hydrogen and methane. The rated capacity of this plant is 250,000 cu. ft. input of mixed gases per hour, and the following yield is obtained:

Gas—	Per cent by weight
Hydrogen	0.5
Methane	34.2
Ethylene	22.0
Ethane	14.0
C_3 stream containing:	
Propylene	19.0
Propane	4.0
C_4 stream containing:	
Butylene, isobutylene, and butadiene	5.5
Butane	1.0

The yields depend upon the charging stock employed and the operating conditions in the cracking furnaces. Flexibility of the plant is an important feature, enabling production of olefins and aromatics to be adjusted within certain limits to suit prevailing market conditions.

Hydrogen and methane and some of the ethane yield constitute the residual gases which may be either partially or wholly piped to the Partington gas works of Manchester Gas Corp., as already described, or used on the plant as fuel.

The cracking plant and the main boiler plant are already equipped with alternative gas and oil-burning equipment and all the process furnaces on the plant are similarly equipped.

The distillation plants, in which the aromatics in the liquid yield from the cracking furnaces are partially separated and purified by atmospheric, vacuum, and azeotropic distillation.

One of the great advantages of the Catarole process lies in the purity of the fractions obtained from the liquid cut. Only minor chemical treatment is required after distillation to yield pure and nitration grades of benzene, xylenes, and toluene. A wide range of higher-boiling aromatic solvents—of exceptionally good color, odor, and stability—is also obtained from the distillation plant, together with a variety of polycyclic aromatics listed in full on the accompanying diagram.

Several plants for the production of chemical derivatives.—These include units for the production of isopropanol, ethylene, and ethylene oxide which is either sold as such or is converted to glycols, ethylanomines, or glycol ether and esters.

The power station and cooling-water plant, supplying power, stream, cooling water, and compressed air to the plant.

Steam is generated at 650 psi. by three Foster Wheeler boilers, which feed two back-pressure turbo alternator sets each rated at 2,000 kva.

Cooling water is drawn direct from the River Mersey and, after passing through settling ponds, is circulated around the site via a ring main. Two cooling-water pumping stations are installed—one to pump from the Mersey to the settling ponds and a second to feed the ring main with water from the ponds. Each station contains centrifugal pumps delivering a total of 3,000 to 4,000 tons of water per hour (13,450 to 17,933 U. S. gallons per minute), while provision has already been made for the installation of additional equipment at a later date.

An interesting feature of the power and utilities services is the care which has been taken to provide facilities for balancing the thermal and power requirements of the plant as a whole. Practically all the steam-driven equipment on the plant (e.g. in particular the gas compressors in the gas-separation plant) employs me-

dium-pressure exhaust steam from the turbo-alternators, while the exhaust steam from the medium pressure equipment is available in turn as low-pressure process steam.

All low-pressure condensate is collected and returned to the power station for deoiling and reuse. By the provision, at strategic points, of alternative electric and steam equipment, the whole system may be maintained in balance—in other words the demand for medium-pressure steam may be kept approximately equal to the supply of turbine exhaust steam available under the prevailing conditions of electrical load.

Partington Industrial Estates, Ltd.

Power-generation and cooling-water facilities can easily be operated on a considerably larger scale than the present demands of the Petrochemicals plant alone would warrant, and provision has been made for further very considerable expansion. For example, duplicate cooling-water mains are already laid under main roads so that the supply of cooling water could be almost doubled without undue disturbance. As has already been indicated, the object of these provisions is to make available comprehensive utility services to factory sites on the estate surrounding the Catarole plant.

It will be appreciated that the advantages open to factories on the estate are extensive. First, cooling water; high, medium and low-pressure steam; electric power, and compressed air are available under the economical supply conditions which result from the use of large central plants. Secondly, a full range of olefinic gases and other chemical raw materials is available on the spot. Thirdly, provision has been made for setting up, at the appropriate time, housing, canteen, recreational, and welfare facilities. Fourthly, main access roads crossing the estate have already been laid. Finally, the extensive research and technical service facilities of Petrocarbon, Ltd., will be readily available.

A new company—Styrene Co-Polymers, Ltd. —also has been formed by Petrochemicals, Ltd., jointly with the Lewis Berger group, for the erection of a satellite plant to produce styrenated-oil surface coatings, utilizing styrene products by Petrochemicals, Ltd.

Agreements have also been concluded between Petrochemicals, Ltd., and Erinoid, Ltd., about the production of styrene and polystyrene from Petrochemical benzene and ethylene; with Lankro Chemicals, Ltd., about the manufacture of ethylene and propylene derivatives from ethylene and propylene oxides; and with British Paints, Ltd., about the utilization of the Indene resins produced by Petrochemicals, Ltd., from the alkyl benzene fraction of the Catarole plant.

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More and more petroleum packaging supervisors are proving that *specialized* Oakite materials and methods cut costs, save time and reduce the number of rejects in reconditioning drums and barrels.

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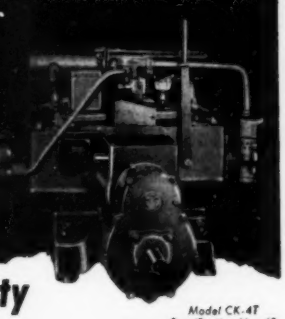

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Dollar Oil vs. Sterling Oil

(Continued from page 175)

From the foregoing it is to be observed that over the 5-year period the marketing position of American companies will decline 12 per cent (from 42 to 37 bbl.) as compared with a decline of only 5 per cent (from 42 to 40 bbl.) for British and British-Dutch companies and a rise of 44 per cent (from 16 to 23 bbl.) for other nationalities.

Movement From Exporting Areas to Importing Areas

Table 4 and coresponding graphical chart, Fig. 4, give a further indication of the inroads expected to be made on dollar oil by sterling oil. It is to be noted that the flow of sterling crude oil in 1953 will substantially exceed the flow of dollar crude oil whereas in 1948 they were fairly evenly balanced. This seems to indicate that sterling crude oil will be utilized to a greater extent than dollar crude oil in 1953 to meet a large portion of the stepped-up refinery throughput of plants owned by other nationalities in the various countries included in the importing areas. This means that the very large increase in refined-products sales by other nationalities will be refined from sterling crude to a large extent. Therefore, such refined product sales by other nationalities are in fact really in part sterling oil replacing dollar oil.

Table 5 and corresponding chart, Fig. 5, reveal that the movement of refined products by British and British-Dutch companies in 1953 will exceed their 1948 movement notwithstanding the very large stepup in their expected refinery output in the importing areas, whereas the movement of finished products by American-owned companies is expected to decline in 1953 as compared with 1948.

Summary and Conclusions

In Table 6 data pertaining to production, refining, and sales have been brought together to give an over-all picture of the operations of each of the three groups of companies. This table indicates that American-owned companies play a large and important role in the foreign petroleum industry.

It has also been observed that for 1948 there was no great difference in the over-all volume of operations of American-owned companies and that of British, British-Dutch-owned companies, i.e., dollar oil was about on a par vis-a-vis sterling oil. However, Table 6 indicates that over the next 5 years a substantial decline is expected in the relative position of American companies in all operations. Plans for refining operations indicate that each of the three groups of companies is apparently to undertake a program of large plant expansion over the 5-year period 1949-53 inclusive.

With respect to marketing operations, plans for refined-product sales indicate a definite decline in market position of American companies in nearly all markets. Therefore, the over-all outlook for dollar oil is generally a downward trend in relative position vis-a-vis sterling oil.

TABLE 5—TOTAL MOVEMENT OF REFINED PRODUCTS TO IMPORTING AREAS
(Thousands of barrels daily)

Importing areas and nationality of companies	1948		1953		Increase		Relative position for each 100 bbl. of refined products moved to importing areas	
	1,000 bbl. daily	Per cent of total	1,000 bbl. daily	Per cent of total	1,000 bbl. daily	Per cent	1948 (bbl.)	1953 (bbl.)
Latin America:								
American	184	27	196	32	12	7	70	65
British, British-Dutch	78	11	106	14	28	36	30	35
Others	....	....	....	....	....	....	....	....
Total	262	19	302	22	40	15	100	100
O.E.E.C. countries:								
American	226	33	108	18	*118	*52	42	32
British, British-Dutch	314	44	226	30	*88	*28	58	68
Others	....	....	....	....	....	....	....	....
Total	540	39	334	24	*206	*38	100	100
Other Western Europe:								
American	22	3	10	1	*12	*55	42	23
British, British-Dutch	30	4	34	4	4	13	58	77
Others	....	....	....	....	....	....	....	....
Total	52	4	44	3	*8	*15	100	100
Africa:								
American	88	13	96	16	8	9	60	59
British, British-Dutch	58	8	68	9	10	17	40	41
Others	....	....	....	....	....	....	....	....
Total	146	10	164	12	18	12	100	100
Asia:								
American	92	14	128	21	36	39	36	35
British, British-Dutch	166	24	236	31	70	42	64	65
Others	....	....	....	....	....	....	....	....
Total	258	19	364	27	106	41	100	100
Oceania:								
American	64	10	74	12	10	16	50	44
British, British-Dutch	64	9	96	12	32	50	50	56
Others	....	....	....	....	....	....	....	....
Total	128	9	170	12	42	33	100	100
Total importing areas:								
American	676	100	612	100	*64	*9	49	44
British, British-Dutch	710	100	766	100	56	8	51	56
Others	....	100	....	100	....	....	....	....
Total	1,386	100	1,378	100	*8	*1	100	100

*Decrease.
Note: Exporting areas include: North America, Caribbean, Middle East, and Far East.

TABLE 6—SUMMARY AND COMPARISON OF TOTAL FOREIGN OPERATIONS OF AMERICAN-OWNED COMPANIES, BRITISH, BRITISH-DUTCH-OWNED COMPANIES AND OTHER NATIONALITIES
(Thousands of barrels daily)

	1948 (bbl.)	1953 (bbl.)	Increase (bbl.)	Increase Per cent	Relative position for each 100 bbl. 1948 (bbl.)	Relative position for each 100 bbl. 1953 (bbl.)
American-owned companies:						
Crude production	1,560	2,456	896	57	50	47
Refining	1,101	1,675	574	52	39	37
Sales refined products	1,123	1,486	363	32	42	37
British, British-Dutch:						
Crude production	1,316	2,272	956	73	42	43
Refining	1,262	1,896	634	50	45	42
Sales refined products	1,140	1,602	462	41	42	40
Other nationalities:						
Crude production	270	504	234	87	8	10
Refining	462	983	521	113	16	21
Sales refined products	430	910	480	112	16	23
Total foreign:						
Crude production	3,146	5,232	2,086	66	100	100
Refining	2,825	4,554	1,729	61	100	100
Sales refined products	2,693	3,998	1,305	48	100	100

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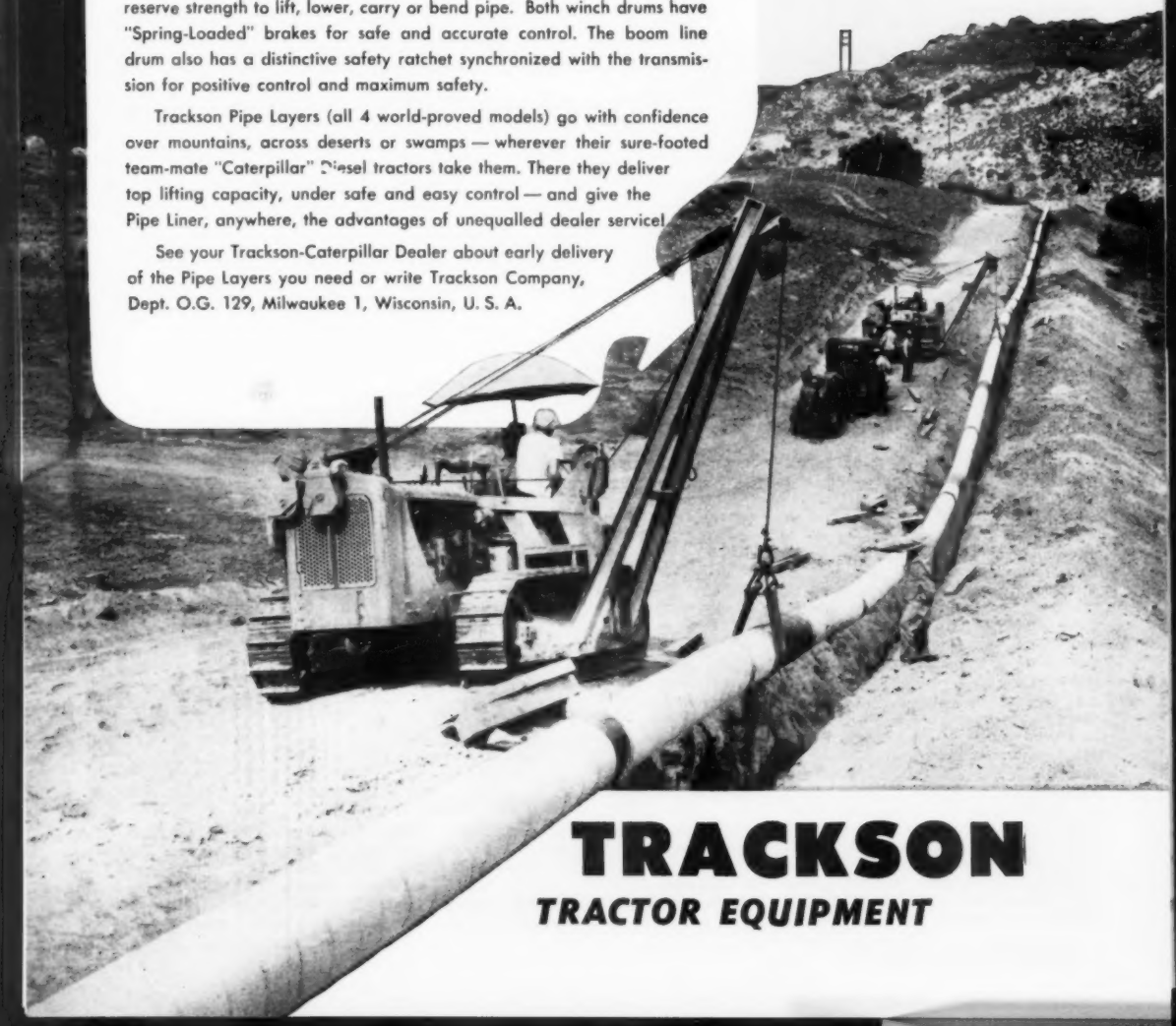


TRACKSON

TRACTOR EQUIPMENT

Drilling in Chimire field

(Continued from page 148)

by carrying through a strong safety program and laying stress on good housekeeping.

The rig crews are wholly Venezuelan and are comprised of a driller, four roughnecks, and a fireman or diesel mechanic for each tour. A Venezuelan "nipple chaser" is also used for coordinating supplies and special gangs between rigs. It was recognized that these crews were not performing to their full capabilities largely because they had not received proper training. A combined drilling-training and safety program was instituted to attend to this deficiency.

To aid this program a mobile lecture room in which films can be shown is moved from rig to rig. The crews are taken off the rig, while a special crew keeps the rig going, and are given approximately 3 hours' instruction each week. Drilling supervisors, safety and training section men, and petroleum engineers all contribute toward the presentation of material for the lectures and for instruction books given to the crews. Although it is not possible to decide how much this program as a whole has contributed to the admitted improvement in drilling rates there is evidence that it has done so. Accident-frequency rates alone have fallen during the year from 250 to 60.

Efficient Nationals

A great deal of credit for the increased drilling speeds is due to the Venezuelan drillers and crews. The manner in which they have absorbed the drilling training and put it to use has been gratifying.

Before unitization of rigs began, a list of the various components to be unitized was prepared. Notations of what benefits could be expected from unitization were added and from these the plans were drawn up. Abbreviated lists are shown hereunder. Table 2 is for the steam rigs and Table 3 for the power rigs.

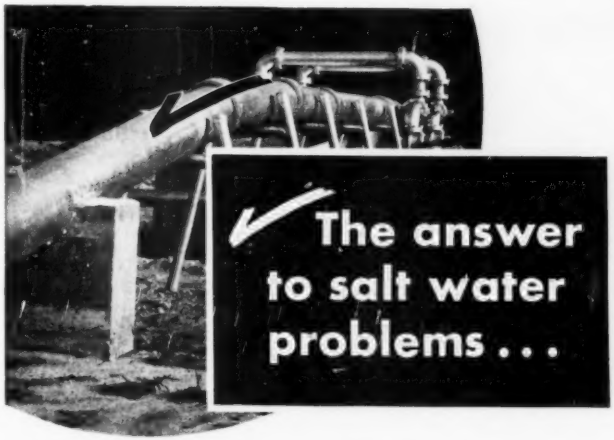
The primary factors which limit unitization are the size of transportation units available and the load-bearing properties of the terrain. In the field under consideration the rainy season lasts for about 5 months. The soil, however, is sandy and well drained. It was assumed from the start that loads of 20-25 tons could be transported at any time during the year. It has since been found that even heavier loads may be handled. Designing equipment units for the 20-25 ton maximum meant that large units such as the steam pumps would constitute a full load. Therefore, the pump manifold was mounted on a separate skid unit to be attached to the pumps by means of unions.

As may be seen from Tables 2 and 3, the main objective of unitization was to reduce the number of piping connections needed to rig up and tear out. In an isolated area such as Chimire field it is not possible to keep all sizes and lengths of nipples, etc., available for use while rigging up, and even if it were possible, much time would be lost making such connections. The problem essentially became one of dividing all the piping into units of a size which could be readily handled, and equipping them with quick unions for rapid assembly and breaking out. This meant that the major pieces of equipment would have to be spotted on the site more carefully so all units would fit. This problem was solved by the use of double swing and swivel joints.

Rig-up time gradually has been reduced through continual effort and practice so that a steam rig and derrick can be rigged down, skidded 600 m., rigged up and made ready to spud in 18 hours. The corresponding time for a power rig is 22 hours.

No one rig has yet been completely equipped with all the units described in this report. The plan has been to construct each unit, install it on a rig and try it out. After observing its performance it may be modified but, if successful, it will be introduced on other rigs.

With the rig-unitization program under way, work began on selection of a drilling string that would increase the penetration rate. Com-



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plete bit records were available from wells drilled through similar formations in nearby fields. Graphs were plotted showing depth versus drilling time for a number of bits of various makes. From this information, the best bit for the area was selected. It was a new model, cone type with extra-long teeth. This model bit is used from about 1,400 ft. to total depth. Perhaps 50 per cent of the decreased drilling time may be credited to this bit.

To help select the proper drill-collar string, several holes were drilled, each using a different number of 6¼-in. 62.4-lb. per foot collars. Based on such factors as hole deviation and desired bit weight, a string of 12 collars was selected. This gave a total drill-collar weight of about 22,500 lb. or, an effective weight, deducting mud buoyancy, of about 18,000 lb. The general practice permits a maximum of 13,000 lb. drilling weight on the bit or about 75 per cent of effective drill-collar weight. The best rotary speed was found by experience not to be a constant and varies between 120-180 r.p.m.

Graphs on bit performance were plotted and show that, ordinarily, the effective bit life was used up (i.e., the penetration curve began flattening rapidly) after 18 hours. An effort is made to pull the bits after 18-20 hours, or earlier if the penetration rate falls off.

TABLE 4

Well—	Cost (per cent)†	Total depth (ft.)
CHV-1	130.4	*8,012
CHV-2	165.6	*8,301
CHV-3	100.0	8,000
CHV-4	80.9	8,301
CHV-5	80.9	8,020
CHV-6	76.1	8,150
CHV-7	60.1	7,121
CHV-8	64.7	7,283
CHV-9	62.9	7,224
CHV-10	60.0	7,670
CHV-11	57.5	7,841
CHV-12	46.6	7,220
CHV-13	67.5	8,000
CHV-14	65.0	7,230
CHV-15‡	45.5	7,150
CHV-16‡	40.9	7,200
CHV-17‡	51.7	8,000
CHV-18‡	56.1	8,100

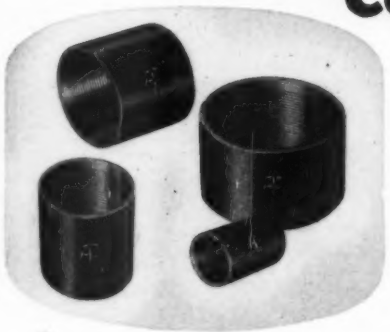
*Wildcats. †Includes only expense from spudding until total depth was reached, less cost of surface casing. ‡Estimated. Figures taken from cost estimates prepared for indicated depths. Final cost figures not yet available.

To reduce downtime on steam pumps, liners were selected so that the same size liners could be used throughout drilling and testing. Trials showed that the 7¾-in. size would give satisfactory performance on the 20-in. pumps under all conditions. On the power rigs liner changes have to be made. The main drilling pumps are self-contained triplex-type units driven by high-speed diesels which need only to be connected into the fuel and mud system to be ready for service. The connection into the mud system is made through rubber or steel rotary hoses equipped with unions.

Table 4 and the accompanying graph show how drilling time and costs have been reduced by the foregoing efforts. The cost figures show a reduction of costs from 100 per cent as of January 1948 to date. The drilling-rate graph shows a reduction in rig time from 31 days to 7,250 ft. on 1 Chimire to 11½ days on 20 Chimire. The 20 Chimire, drilled to 7,250 ft. in 11½ days, and 21 Chimire in 11¾ days to 7,075 ft., were drilled exceptionally fast. The present average is more like 13 Chimire in which a depth of 7,250 ft. was reached in 18 days.

There is still such work to be done on unitization and increasing drilling rates. The drilling and petroleum engineering sections of Socony-Vacuum are continually studying phases of the problem. It is felt, however, that the progress made so far is favorable and has justified the expense and time spent in this work. The one factor which has contributed largely to the challenge and lends a moral to the achievement is that no new major items of equipment were purchased during the whole period under review. It has demonstrated that much improvement can be made by planning, training, coordination, and safe working conditions.

Harrisburg Couplings



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Haifa Refinery Produces 80-Octane Gasoline

(Continued from page 153)

cut" of any required e.p.—naphtha, kerosine, and gas-oil side streams, and a residue averaging 47 per cent by volume, which latter was blended off to the required fuel specifications.

Treating Equipment

Gasoline-refining equipment consists of soda washers, acid treaters of the countercurrent "Holley - Mott" type, plumbite treaters of conventional four-stage design, and Badger redistillation units of both two-column and three-column type. In initial refinery operation for 68 and 70-octane leaded gasolines, the two gasoline streams after soda treatment were combined and then acid treated. From analyses of the acid tars produced it was evident that acid treatment led to three main actions:

1. Extraction unchanged of ring-sulfur compounds (thiophanes).
2. Oxidation of mercaptans to disulfides.
3. Extraction of the disulfides formed in (2).

Since (2) and (3) could be equally well performed in the doctor-treatment and redistillation stages, and conservation of sulfuric acid was of very first priority, the efficiency of the extraction of thiophanes was of greatest importance. The majority of these compounds found in the acid tars boiled above 120° C. (248° F.) hence it was obvious that segregation of the heavy cut for acid-treatment would increase the efficiency of thiophane removal in two ways—first by removing the light cut mercaptans from the sphere of action, and second by increasing the concentration of thiophanes in the oil under treatment. In actual operation a saving of 60 per cent of acid was obtained for the same final gasoline quality. The refining scheme eventually adopted is shown in the accompanying diagram. Heavy cut acid treatment was at the rate of 5 lb. per barrel.

When operating for a final e.p. of 140° C. (284° F.) which gave a 53-octane base spirit leading up to 80-octane (motor method) with 3 cc TEL per U. S. gallon, sulfur contents of the gasoline cuts at the various stages are shown in Table 1.

TABLE 1

	Total S (% wt.)	Mercaptan S (% wt.)
Soda-washed light cut	.030	.030
Soda-washed heavy cut	.095	.045
Acid-treated heavy cut	.030	.005
Feed to doctor treater	.030	.015
Product of doctor treater	.035	Nil
Rerun gasoline	.010	Nil

An interesting sideline of the acid treatment was noticed on changing over from a 175° C. (347° F.) e.p.

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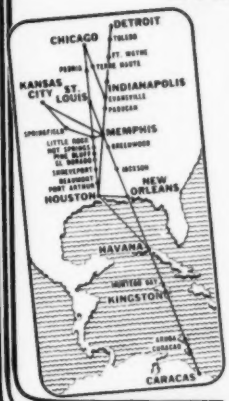

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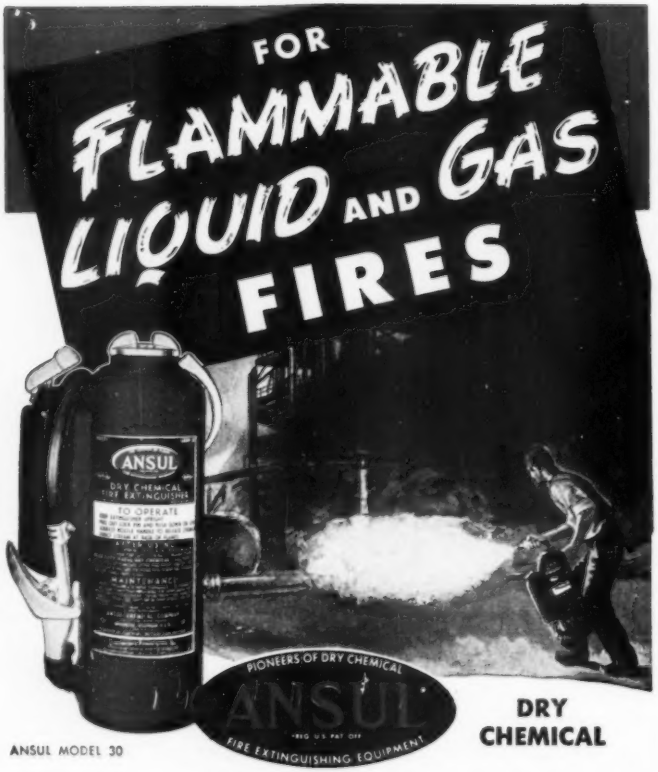

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FIRE EXTINGUISHER DIVISION, MARINETTE, WISCONSIN

DISTRIBUTORS IN PRINCIPAL CITIES IN THE UNITED STATES, CANADA, AND OTHER COUNTRIES

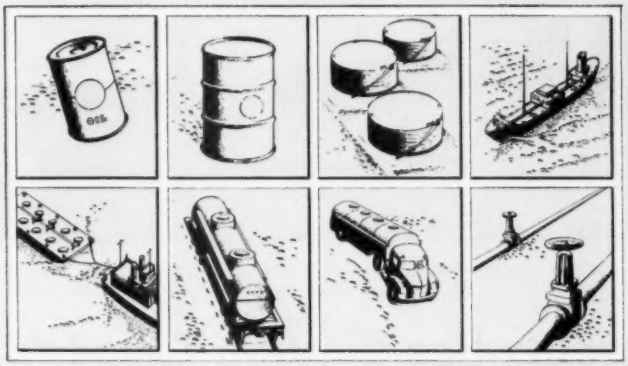
heavy cut to a 145° C. (293° F.) e.p. product. The steel impellers of the acid-treated product pumps, which formerly corroded very slowly, suddenly began to corrode quickly, and heavier corrosion was also noticed on pump casings and product lines. In the vicinity of one of the holes which appeared in a pump casing was found a mass of pale green crystals which, on analysis, proved to be ferrous m-xylene sulfonate dihydrate. Similar crystals found in locations which had been in contact only with the higher-boiling product were found to be mainly the ferrous salts of the C_9 series of aromatic sulfonic acids, such as mesitylene and pseudocumene. It was then found that the free sulfonic acids, when in the anhydrous state, were soluble in the gasoline cut to the extent of 0.0001 N.

After contact with water, the acids were slowly thrown out as crystals of the dihydrates or as strong aqueous solutions, and this happened in the plant after the water and soda-washing stages, i.e., in final tankage, lines, and pumps. While treating the 175° C. (347° F.) e.p. cut the most readily sulfonated hydrocarbons were the C_8 metacompounds, whose sulfonic acids are quite weak. On changing to 145° C. (293° F.) e.p. heavy cut, the most readily sulfonated aromatic hydrocarbon was m-xylene, whose 4-sulfonic acid is considerably more active, in fact a 20 per cent solution of the acid at 100° F. attacks mild steel with effervescence. The remedy was the very simple one of increasing the strength of the final soda wash, a slight carryover being then sufficient to neutralize the acid solutions thrown out.

Disposal of byproducts, often difficult and sometimes expensive, has in this refinery been a comparatively simple matter. The spent soda solutions, containing sulfide and hydrosulfide, were sold to a local concern manufacturing 60 per cent Na_2S for the tanning industries. The acid tars, containing 50 per cent H_2SO_4, varying quantities of sulfonic acids, and organic sulfur compounds, were disposed of to another local firm who used the H_2SO_4 content, after suitable treatment, for the manufacture of superphosphate fertilizers. The presence of calcium sulfonates in these products is reputed to be of some value in seed germination.

During the war, when aromatic hydrocarbons in this area were at a premium, production of xylenes and C_9 hydrocarbons by acid hydrolysis of the sulfonic acids in the tars was attempted on the pilot-plant scale, and for the same reason the bottoms from the redistillation units, containing up to 20 per cent of aromatics, attracted some interest. Difficulties of separation from the ubiquitous cyclic sulfur compounds was the main drawback to both these possibilities.

Which fits into



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Residue gas from field processing operations of Royalite Oil Co., Ltd., in Turner Valley, is processed in this plant by Western Propane, Ltd. Products from the operation are liquefied petroleum gases

Royalite Has Western Canada's Largest Compressor Station

TODAY Royalite Oil Co., Ltd., has in Turner Valley, Alberta, Canada, 78 oil and 59 gas wells either producing or capable of producing. This company also operates in the area a 100-million-cubic-feet per day natural-gasoline absorption plant. Field gas gathering facilities are operated by Madison Natural Gas Co., a Royalite totally owned utility company. Formerly flared residue from the natural-gas processing plants of Gas & Oil Products, Ltd., and British American Oil Co., Ltd., is also gathered by Madison. These plants, too, are located in Turner Valley field. All gas handled by the Madison system is processed in a scrubber plant which has a capacity in excess of 90,000,000 cu. ft. daily.

Gas from the Madison scrubbing plant is distributed by Canadian Western Natural Gas Co. for domestic and industrial consumption in the cities of Calgary and Lethbridge. Scrubbed gas is also used for field injection. During summer months, up to 18 million cubic feet per day are returned to gas storage wells.

Residue gases from the Royalite plant stabilizer and reabsorber operations are delivered by Madison to the plant of Western Propane, Ltd., for the extraction of propane which Western Propane markets as bottled gas. Royalite is currently delivering

THE OIL AND GAS JOURNAL

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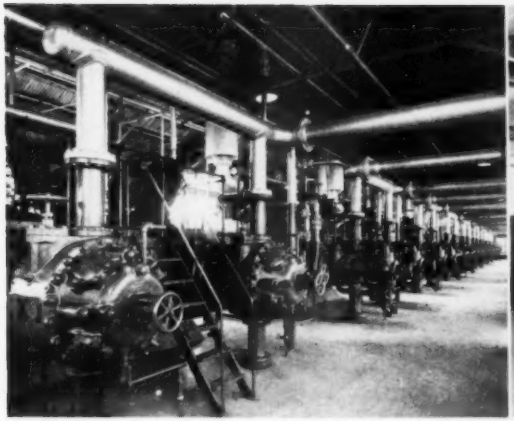
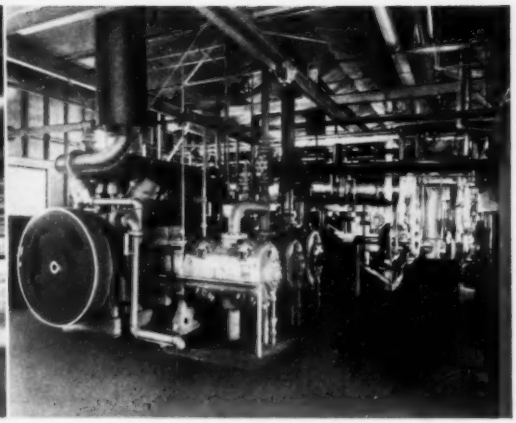




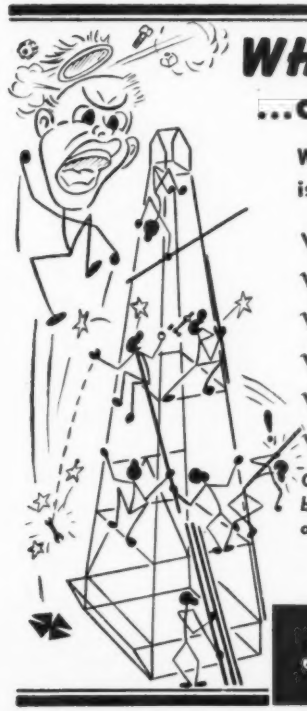
Left: The 10-unit compressor station operated by Madison Natural Gas Co. This installation is believed to be the largest of its kind in Canada. Right: These two compressors, a 200-hp. unit and a 600-hp. unit (foreground), handle residue gas from an absorption plant operated by Royalite Oil Co., Ltd.

approximately 1.8 million cubic feet of gas per day to Western's nearby plant for this purpose.

Considering the scope of Madison Natural Gas Co. operations it is not surprising that its main compressor station is easily the largest in western Canada if not in the entire dominion. The station is also considered one of the most modern and best maintained to be found in Canada.

With the addition, this summer, of a tenth engine-driven V-angle compressor unit to maintain station volume capacity at lower suction pressures, total compressor horsepower for the installation rose 6,060. This most recent addition, the tenth compressor, incorporates Cooper-Bessemer's new Turboflow feature. The new unit, the same size and type as the older ones, is rated 660 hp. at 300 r.p.m. whereas the others are rated 600 hp. at 300 r.p.m. The 10 per cent increase in rating on the newer unit over that of the older compressors is a result of Turboflow design.

The new Turboflow unit, first to be installed in Canada, has a maximum fuel consumption of 8,500 B.t.u. per horsepower hour instead of the customary 1,000 B.t.u. previously established for units of this type.



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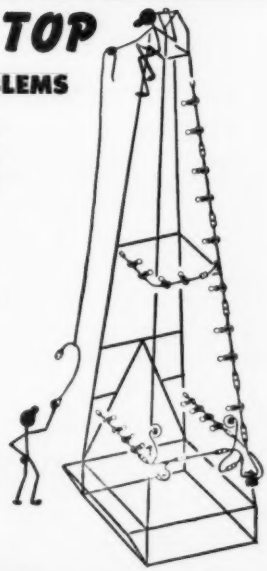

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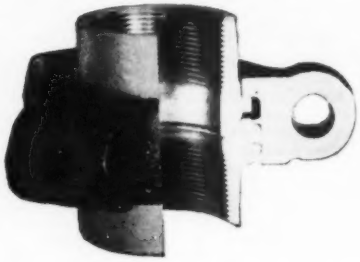

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Bahrein's Refinery

(Continued from page 155)

id, and the use of the small "guard" chambers and recycled cooling butane provides ease of control. Raw polymer gasoline is stabilized to the desired vapor pressure in a column originally constructed as a butane rerun still for the isomerization plant.

The current construction program at Bahrein is designed to enable the refinery to produce a greater number of different products as well as improve the quality of these products. It is intended to balance out the over-all refining operation at about 15,000 bbl. daily crude charge and, in addition to process units, construction is proceeding on enlarged shipping facilities, steam and power-generation facilities, almost 3,000,000 bbl. of tankage, increased staff housing, an addition to the man office building, and a new modern research laboratory. Certain gasoline and asphalt-production and crude-distillation facilities have already been completed and are now in operation.

Distillation equipment being constructed includes a 55,000-bbl. per day atmospheric crude unit designed to tie into the existing vacuum section now operating on reduced crude produced at the catalytic cracking unit fractionating area. This new atmospheric unit is scheduled for completion by January 1951. The new crude distillation facilities which have been and are being constructed are intended to provide an improved degree of fractionation and sufficient flexibility to meet any reasonable shift in market requirements.

With the beginning of operations on Bahrein Island, the company has realized the importance of promoting educational and social projects designed to improve conditions for the Bahreini population. A modern residential community of air-conditioned cottages, with an air-conditioned hospital and a theater, had grown on the desert at Awali, about 4 miles from the refinery site, in 1936. Free bachelor housing, including utilities, is provided for all Bahreini employes desiring it. Most employes, however, prefer to live in their own villages.

The company takes an active part in fostering civic improvements and private housing in surrounding villages. The principal city, Manama, is soon to be provided with a modern water-supply and sewer system.

Two modern, well-equipped hospitals in addition to outlying dispensaries are operated by the company. Free medical care is provided for all employes. The company has taken an active part in agricultural development, road and bridge construction, malaria control and the drilling of water wells. As a result of these activities and of the general prosperity of the island, steady improvement is being achieved in the standard of living of the Bahreini population.

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Last year, 152 refineries reported 298 fires. That's almost two apiece. Biggest losses were in such capital investment items as buildings and equipment . . . not in oil stocks. And when structures start blazing, fire hose has to get to work fast, *or else!*

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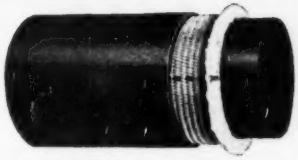

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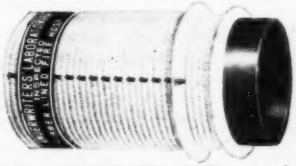

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Multistage Separation of Gas and Oil in Kuwait

(Continued from page 150)

8,000 bbl. of oil a day with a gas-oil ratio of 550-650 cu. ft. per barrel delivering the same at 425 psi. pressure to a central point of gas and oil separation; the length of flow line being the maximum length to be expected within a 4-mile-square producing area as mentioned previously. Subsequent flow lines, laid after this study, commensurate with the receipt of pipe, have all been 6-in. diameter and the gathering centers designed for an initial separation pressure of 425 psi.

The number of stages of separation was based also upon the Anglo-Iranian practice of six or seven stages of separation which they had been using successfully for a number of years.[1] This was a major departure from common practice in the United States of having no more than three or four stages of separation for similar pressure conditions.

Same Total Equipment Costs

Offhand the first reaction of everyone not accustomed to large multistage separator settings is that they require much more equipment with an unnecessary attendant increase in capital investment. For the large volumes of oil and gas to be handled, however, this is not particularly the case and the problem resolves itself principally into whether or not to have several separators at each of a few separation stages or only one separator at several stages of separation since, essentially, the same amount of equipment is required under either system from the standpoint of capacity.

As a consequence the multistage system was favored as this system approached differential liberation of the gas from the oil, thereby taking advantage of the natural-gas laws for retaining the greatest percentage of usable hydrocarbons in a liquid form. This not only results in a greater volume of oil recovered for the same volume of well effluent produced but also results in a slight improvement in gravity.

This is illustrated graphically in Fig. 2, which, shows for example, that of the total isopentane component (i-C_5) only 39 per cent is recovered in liquid form if the gas is separated from the oil by flashing directly to atmospheric pressure against a recovery of 75.5 per cent for three stages of separation and 83.5 per cent for seven stages of separation. The optimum pressure for the initial stage of separation would be between 800 and 900 psi., if this pressure could be attained, which is the pressure range where the minimum equilibrium constant (K-factors) values occur and, consequently, no advantage would be gained by exceeding this range.

Table 1 shows the probable increase in liquid recovery and A.P.I. gravity of seven stages of separation over flashing the oil directly to atmospheric pressure and three stages of separation.

TABLE 1

Stages:	1	3	7
Pressures:	Atmos.	*425 lb. †100 lb. Atmos.	*425 lb. †200 lb. 100 lb. 50 lb. 25 lb. 10 lb. Atmos.
A.P.I. gravity:	28.3	31.1	31.6
Liq. volume, %	100.0	105.9	107.5

Assumed temperatures: *100° F.; †90° F.; all others 80° F.

The data in Table 1 indicate approximately 1.6 per cent additional liquid recovery for seven stages of separation over three stages of separation or approximately 1,600 bbl. a day on the basis of the maximum separating capacity of each gathering center of 100,000 bbl. a day with an increase in A.P.I. gravity of 0.5°.

The data plotted in Fig. 2 and shown in Table 1 are derived from theoretical calculations and it has not yet been possible to check the operation of the separators in actual service. There is no reason to believe, however, that the actual operation will not follow reasonably close to

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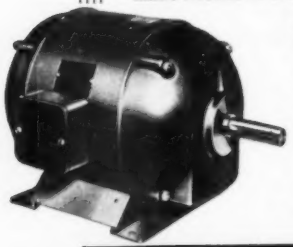

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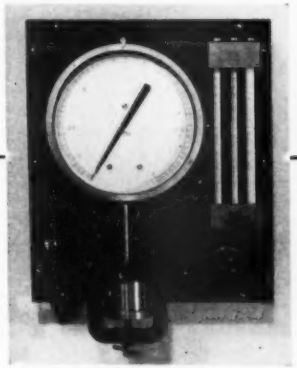

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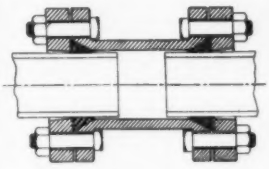

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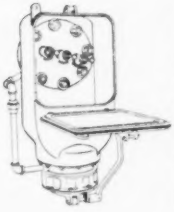

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Manufacturing Co.
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the natural-gas laws upon which the theoretical calculations are based.

Pressures Determined from Data

The approximate operating pressures of the various stages were determined from solubility data on the gas and oil. The pressures are so selected that the actual volume of the free gas released at each stage of separation is approximately the same as the volume of the free gas removed from any other stage, the volume of the gas in each case being calculated at the respective operating pressure and temperature of the stage concerned. In other words, the velocity of the gas through the separators, which are of uniform diameter, is about the same in all separators.

The arrangement of the separators for seven stages of separation is shown schematically in Fig. 3. Two separators were necessary at the 425-psi. stage to handle the free gas accompanying the oil from the wells over which no control could be exercised. Two separators were also installed at the 10-psi. stage rather than installing one separator at a slightly higher pressure stage because of pressure limitations as to control valves.

Individual 6-in.-diameter flow lines are laid from each well to the gathering center. Each flow line is connected to two manifolds at the gathering center, one manifold to each of the 425-psi. separators. With this arrangement it is possible to proportion the production perfectly to each of the 425-psi. separators insuring that each separator operates at its maximum capacity. The individual flow lines are also connected to a third manifold permitting any one well to be diverted to a small test separator setting for periodic testing.

The oil to the two 10-psi. separators is proportioned evenly from the 25-psi. separator by oil control valves actuated by valve positioners which maintain the control valves to each of the 10-psi. separators at identical openings. Four low-head, high-volume, centrifugal pumps, equipped with gas-turbine drives discharge the oil from the 10-psi. separators at 50-60 psi., the pressure required to deliver the oil to two 50,000-bbl. flow tanks. In the event of these pumps stopping, a bypass from the 50-psi. separator opens automatically and delivers the oil directly to the tanks. The 50,000-bbl. tanks are equipped with a 36-in.-diameter vapor flare line. Three gas-engine-driven centrifugal pumps, each having a capacity of 35,000 bbl. a day at 750-psi. pressure, deliver the oil 15-20 miles throught 20-in.-diameter lines to the main tank farm at Ahmadi where it is stored, pending marine shipment by gravity loading, in 168,000-bbl. tanks.

Probably the most interesting feature of the gathering centers is the use of orifice meters for allocating the oil and gas to the individual wells. These meters are located on the well flow lines immediately ahead of the 425-psi. separators and measure the combined flow of oil and gas from each well. The total daily production as indicated by tank gages and master gas meters, is allocated to the wells on the basis of factors derived from the line meters.*

The meters are installed in the normal manner using standard commercial orifice fittings. To avoid using water seals to keep the oil out of the meters, 2-in.-diameter pipe chambers, 30-in. long, are welded vertically on the meter runs the standard $2\frac{1}{2}$ and 8 diameters from the orifice plate. From the tops of these chambers customary small meter lines are connected to the meters. When a well is flowing any fluid within the chambers is displaced immediately by free gas carried in the flow line giving a complete gas seal, free from any liquid, from the meter run to the meter.

Variable-flow beans are installed on the flow lines ahead of the meters at the gathering centers. The flow from each well can be controlled at this point and all fittings are capable of standing the possible full shutin well-head pressure of 1,500-1,700 psi.

References

1. Multistage Stabilization of Crude, H. S. Gibson, A.I.M.E. Tech. Pub. No. 1,085, 1939. Oil Production in Iran, H. W. Lane, O.B.E., The Oil and Gas Journal, August 18, 1949.

*This system is described in a paper by D. Comins in the Journal of the "Institution of Petroleum Technologists" London. Vol. 24, No. 173, March 1938.

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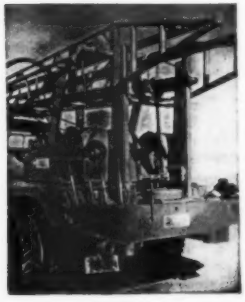
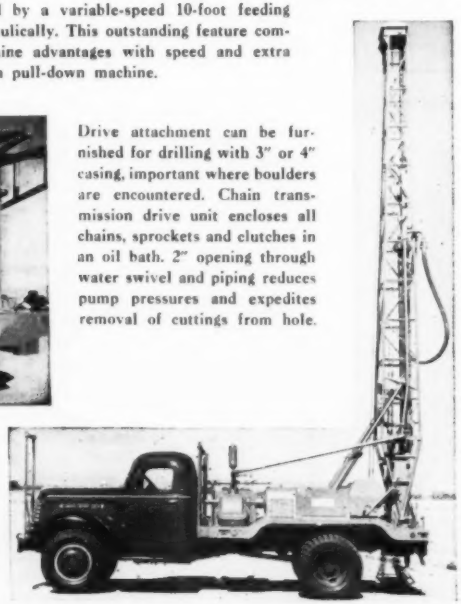
The new heavy duty FRANKS KC-45 Drill is designed for heavy duty shot hole work where the drilling is rough, and is equally efficient on core drilling. To 1500 feet FRANKS KC-45 is tops!

Drilling is controlled by a variable-speed 10-foot feeding device operated hydraulically. This outstanding feature combines hydraulic machine advantages with speed and extra ruggedness of a chain pull-down machine.



Drive attachment can be furnished for drilling with 3" or 4" casing, important where boulders are encountered. Chain transmission drive unit encloses all chains, sprockets and clutches in an oil bath. 2" opening through water swivel and piping reduces pump pressures and expedites removal of cuttings from hole.



All controls are so designed and arranged to provide maximum convenience and ease of operation. A hinged breakout tong mounted on the rig provides greater speed and safety in breaking out.

Write today for complete specifications and information on this heavy duty Model KC-45 Drill.

Franks MACHINE CO.
203, East Maine Enid, Okla.
Exclusive Export Distributor
ACME WELL SUPPLY COMPANY
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NOW WITH BITS PRESSURE TESTED TO 2500 POUNDS TO GUARANTEE PERFORMANCE

A-1 Combination Bit.

A-1 Welded-in Blade Bits are available in two, three and four-way types

This hydraulic test rack is just another precaution that A-1 takes to insure maximum dependable performance in the field from every A-1 bit . . . A-1 Combination Bits, A-1 Welded-in Blade Drilling Bits, A-1 Jet Type Bits. This 2500 lbs. pressure . . . more than will ever be encountered in normal drilling operations . . . tests slush nozzles and water courses as well as the main body of the bit. Due to precautions such as this hydraulic test . . . typical of the extra care exercised throughout the manufacture of A-1 products . . . A-1 Bits consistently perform circles around any other type of bits. Put this extra speed, extra long life, extra quality to work for you.

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Unique design of the "Dryseal" Thread provides actual crushing and sealing at both major and minor diameters, effectively preventing spiral leakage, even under extreme pressures.

Incorporates all the important features of the regular "UNBRAKO" Pressure Plug, including fully formed threads, uniform taper and perfect roundness.

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OVER 46 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNSYLVANIA, BOX 790
Chicago • Detroit • St. Louis • San Francisco

Tapline's Second Year

(Continued from page 167)

been placed for their convenience a short distance from each camp site. At some of the new oases as many as 5,000 camels, sheep, goats, and donkeys have been seen together, all awaiting their turns to drink.

The pump station near the old Arabian fort of Hafar al Batin, 315 miles from Abqaiq, which was started June 1, is already well advanced and will be ready for use by next May, while grading and general facilities are in various stages of progress at the other stations, work on which was started more recently.

Each station will be surrounded by an 8-ft. cyclone fence 3,700 ft. long and 1,750 ft. wide, with an airfield nearby. There will be five Byron Jackson pumping units in series powered by five 1,710-hp. Worthington diesels weighing about 70 tons apiece. Four of these units will be operating and there will be one standby. The pumping capacity will be 315,000 bbl. per day.

Three General Electric generators run by three 1,320-hp. Worthington diesels will provide power for the booster pumps and other electrical equipment. There will be one 96,000-bbl. crude equalization tank and two fuel-oil storage tanks of 2,000 bbl. each, drawing directly from the pipe line.

Besides the main pump house and a booster pump house there will be a warehouse and a shop, a garage, a firehouse, a radio station, and a laundry, all having steel frames and concrete block walls with corrugated galbestos roofs. Other buildings, of concrete-brick construction with wood roof framing and mineral roof surface, will include a dining hall and community center, two car shelters, one four-room bunkhouse, a field hospital, six staff houses, and one superintendent's house. There will also be three Arab bachelor quarters and three Arab family quarters.

There will be a 5,000-bbl. tank for raw water, two elevated treated-water tanks, and two elevated distilled-water tanks. Chicago Bridge & Iron Co. is erecting the tankage at all stations except the one closest to the Mediterranean terminal and the terminal itself. At the two latter sites this work is being done by Graver Construction Co., of New York.

The pipe liners are making steady progress, laying the 30 and 31-in. line as fast as pipe can be delivered. At present the line is traversing a vast gravel plain underlaid by limestone. Across this area most of the line is supported above ground on concrete piers. Considerable blasting is required for the buried portions in this terrain, where the limestone is tough and unyielding.

Restrained type of construction is being followed for the aboveground portions of the line. There are no expansion loops, and the pipe is held stationary by ring girders mounted either on piles or piers, depending on the nature of the ground, at 66-ft. intervals. The pipe line is designed to withstand the stresses of contraction and expansion. Steel H-beam piles embedded in rock or concrete anchor the line wherever changes in direction are greater than 2°. Only 16 anchors have so far been needed.

Belowground portions are handled in the usual way, being cleaned and primed, coated, and wrapped. The asphalt with which the pipe is coated comes from the I.B.I.-built refinery of Bahrein Petroleum Co.

The pipe liners have been forging ahead at a rate in excess of a mile a day. In a recent 3-day spurt they built over 8 miles.

Supporting the pipe liners are four road-building crews and one maintenance crew, with a dozen carryalls, 7 bulldozers, 2 pushcats, 7 motor graders, 32 dump trucks, a Lorain-80 shovel, a Bucyrus 54-B shovel, a ¾-yard Lorain motor crane and dragline, and three Tournadozers, the latter being used on maintenance. Despite a continuous flow of heavy traffic, they have succeeded in making and keeping up a road which is good for long stretches, fair in others, but everywhere passable.

Over this road moves a daily total approaching 200,000 ton-miles of pipe, general cargo, fuel, and water. The hauling equipment in service com-

SEASON'S GREETINGS

and a

hearty 'thanks' to all who

helped in so many ways in the handling and

installation of the 5,500 pairs river

clamps we made in 1949.

E. ROWE FOUNDRY AND MACHINE CO.

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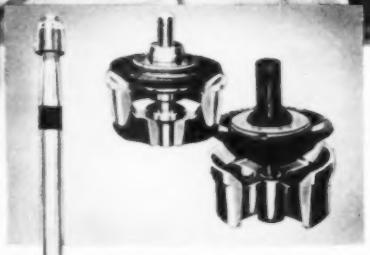
Light-weight, for wells up to 8,000 feet. Ideal for jackknife rigs . . . self-leveling in bowl, increasing safety of men when pipe is off center. Sturdy posts absorb elevator blows. Flexible handles bend, don't break. Available through all supply stores . . . Mission Manufacturing Co., Houston, Texas. Export: 30 Rockefeller Plaza, New York. Europe: London, England.

G - 209 - A



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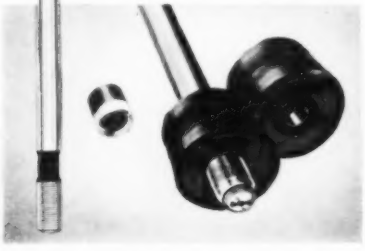

This *New Feature* of MISSION Pistons . . .

THE *"WEAR GROOVE"*

. . . assists the operator in obtaining maximum performance from MISSION Pistons, by signalling when a worn piston body should be replaced. Today's high pumping pressures make it important to keep operating parts in top condition. Use of worn pistons or worn pistons and liners in combination, contributes to 50% of the poor-life complaints that come up . . . Mission Manufacturing Co., Houston, Texas. Export: 30 Rockefeller Plaza, New York. European address: London, England.

MISSION
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G-253-B

prises seventy-five 10-ton 4 by 6 Kenworth tractors, thirty-two 4½-ton 6 by 6 Kenworth flatracks, three 20-ton 6 by 6 Kenworth tractors, twelve 20-ton Kenworth 6 by 6 trucks, and three International 4 by 6 truck tractors, plus 14 lowbed trailers, 72 flatbed trailers, 61 tank trailers, 5 reefer vans, 4 dry vans, and 46 pipe dollies.

As many as ten 93-ft. sections of 30 or 31-in. pipe are carried on each dolly, weighing up to 40 tons, and the trucks go out from Ras el Mishaab in convoys.

General cargo moves out each day from Ras el Misha'ab in separate convoys, one of which may weigh as much as a freight train. Typical was one made up of six 4½-ton Kenworth flatracks, two 20-ton tractor-trucks, and one 10-ton tractor-truck, hauling an assortment of cement, steel, and welding rod, various pump-station material, and a D8 sideboom. The heaviest trailer carried 50 tons, the lightest 18, and altogether the freight weighed 248 tons. The fact can thus be appreciated that a large part of the project is road building and transportation.

In all of these operations—in road building, camp construction, trucking and pipe lining—the most significant development since the start of the Tapline project has been the steadily increasing ratio of Arab employes to Americans. From the very outset the policy of Tapline management, subscribed to by I.B.I., has been to hire as many Arabs as could be absorbed, first as laborers, and then, through an unremitting on-the-job training program, as semiskilled and skilled craftsmen. By December 1947, 490 Americans and 1,306 Arabs were at work on Tapline, a ratio of 2.7 to 1. As of last September there were 748 Americans and 4,053 Arabs, a ratio of 5.4 to 1. In the early days the pipe-line spread was composed of 200 Americans and a few Arab helpers. Today there are over 300 Arabs and only 84 Americans in the integrated pipe gang. Arab welders are developing a high degree of skill, and although none have been assigned to stringer-bead duty yet, the follow-up men among them are giving the Americans a run for their money.

Whereas the big 300-hp. Kenworth trucks were driven exclusively by Americans when Tapline started, now the drivers are Arabs, with Americans serving only as convoy leaders. In the trucking operation an Arab subcontractor furnishes and looks after the drivers, and so it is with the bulk of the other Arabs employed in almost every undertaking from water-well drilling to the running of the skyhook. The several local contractors, all of whom were encouraged by Aramco or Tapline to go into business for themselves, know how to deal with their own people.

It is estimated that the peak American personnel to complete the laying of the I.B.I. portion of the Trans-Arabian pipe line before the end of 1950 will be 1,000, with 6,000 Arabs.

President of Trans-American Pipe Line Co. is Burt E. Hull. Clyde A. Swigart and Al N. Horne are vice presidents. The former replaces E. A. Skinner, who has joined Bahrein Petroleum Co., Ltd., and the latter replaces H. H. Hall, who has retired. The field force is headed by Vice President Al Horne as general manager. Assistant general manager and chief engineer is Jack L. Culbertson, with headquarters at Beirut; William R. Chandler is assistant general manager, with headquarters at Ras el Misha'ab. The general superintendent of the western division is H. B. Beckley, and the general superintendent of the eastern division is D. T. Pinckney.

Williams Brothers Corp., Tulsa, whose president is S. M. Williams, Jr., has at present about 70 Americans and 400 nationals employed at the Mediterranean end, where A. M. Garber is general manager, Jack Burroughs is construction manager, and M. T. Duddleston is general superintendent.

For International Bechtel, Inc., Vice President George S. Colley, Jr., continues to act as project manager, with J. Roy McAuliffe as assistant project manager and chief engineer. General superintendent of pump-station construction is J. W. Hillman, C. E. Barker is general superintendent of transportation, roads, and pipe line, while Roy Middleton is superintendent of the pipe-line spread.

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UTILIZING A GARDNER-DENVER 6-cylinder, 7" stroke plunger type pump, the ICI PL-7 will supply sustained pressures up to 10,000 lbs/sq. inch.

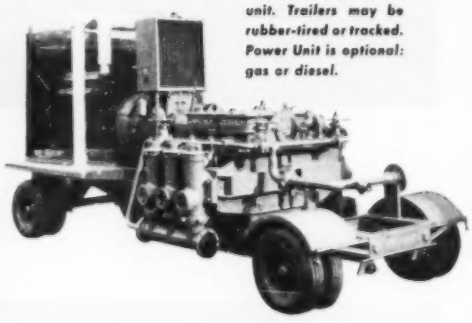
Nearly four years of continuous experience with nine units, justifies our contention that this unit is the most economical and efficient unit of its kind offered for oilfield service.

This cementing unit is available on truck of your choice in the required heavy duty class powered by gas or diesel as specified.

buy with next year's need in mind

Your next deeper zone may have higher pressures than you think and require ICI cementing and/or well-killing and acidizing units

Trailer-mounted well-killing and pumping unit. Trailers may be rubber-tired or tracked. Power Unit is optional: gas or diesel.



Anticipating your need for units suited to deeper and deeper hole conditions, ICI was first to experiment with over 10,000 lbs/sq. in. pressures and high volumetric capacities . . . and FIRST IN THE INDUSTRY to offer you the advantages of the PL-7 unit for export sale. Tried and proven by nearly four years of domestic oil field service utilizing nine units in continuous operation.

These versatile ICI "giants" are ready for service anywhere—desert, mountainous districts, or on jungle leases. You have the choice of a truck, trailer, or skid-mounted unit designed either for cement, mud and oil-pumping jobs or simply for high pressure well-killing and pumping chores. The unit will handle acid jobs if you require or anticipate this additional service.

The pump has three $4\frac{3}{4}$" plungers on one side and three $3\frac{1}{2}$" plungers on the other side. It is manifolded so that both sides provide high volume at low pressures: the $4\frac{3}{4}$" side for medium pressures; and the $3\frac{1}{2}$" side for maximum volume at high pressures. Special manifolding allows you to blank out a cylinder on either side and still operate the pump, thus giving added insurance the job will be completed.

Don't depend on straight pumping units to do an oilfield job. Check the advantages of these cementing and well-killing units by writing today for complete engineering details and prices.

Don't handicap your crews in the field with under capacity equipment for future unknown volume and pressure requirements.

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"T. I. P. S. A." Avenida Rogue Sanez Pena 501, Buenos Aires, Argentina, S. A.

Current Venezuelan Refinery Construction

(Continued from page 157)

duce the conventional overhead products; gasoline, naphtha, kerosine, and light gas oil aggregating about 40-45 per cent of crude charged. A vacuum still, to be completed sometime during the third quarter of 1950, will charge the 55-60 per cent reduced crude, further reducing it to a bottom residual fraction amounting to about 26 per cent of original crude, and producing intermediate and heavy gas oil as distillate.

An asphalt plant, incorporated to serve local Venezuelan demand, will be on stream by March 1950 to produce both cutback and oxidized products. A daily production of 4,300 bbl. of asphalts is planned by 1953. Aside from asphalt, this refinery will produce a line of straightrun fuel products, conventionally treated and finished for marketing. Under present plans, crude fractionation will comprise the operation and no cracking facilities are planned. Initially, about 15 per cent of production will be consumed in Venezuela, and within a few years the rise in local demand may well absorb 50 per cent of the Amuay Bay output. Foster Wheeler Corp. is the contractor for the refinery processing units.

Subsidiaries of two major American companies, Gulf Oil Corp. and The Texas Co., hold a joint interest in a new 30,000-bbl refinery being constructed at Puerto La Cruz, located in the state of Anzoatequi in Eastern Venezuela. The plant was originally designed for 20,000-bbl. daily throughput as an exclusive Venezuela Gulf Refining Co. operation. A later agreement with the Texas Petroleum Co. and its associate, Sociedad Anonima Petrolera Las Mercedes, provided for expansion to 30,000 bbl. with Gulf and Texas Co. interests amounting to two-thirds and one-third respectively. Crude runs and refined products will be shared by companies in the same proportion.

The refinery, which will be completed next summer, features the first use of the polyform process for cracking heavy gas oil with high gas dilution to maximize yields of higher-octane gasoline. This adaptation of the process stems from pilot-plant work conducted at the Gulf research laboratories at Harmarville. Lummus Co. holds the contract for construction of this refinery.

The fourth new refinery under construction in Venezuela is the 35,000-bbl. per day Puerto La Cruz plant of Venezuela Petroleum Co., a Sinclair subsidiary. The contract for construction of this plant was let this year to Frederick Snare Corp. and construction work is progressing according to schedule.

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THE RIDGE TOOL CO. • ELYRIA, OHIO

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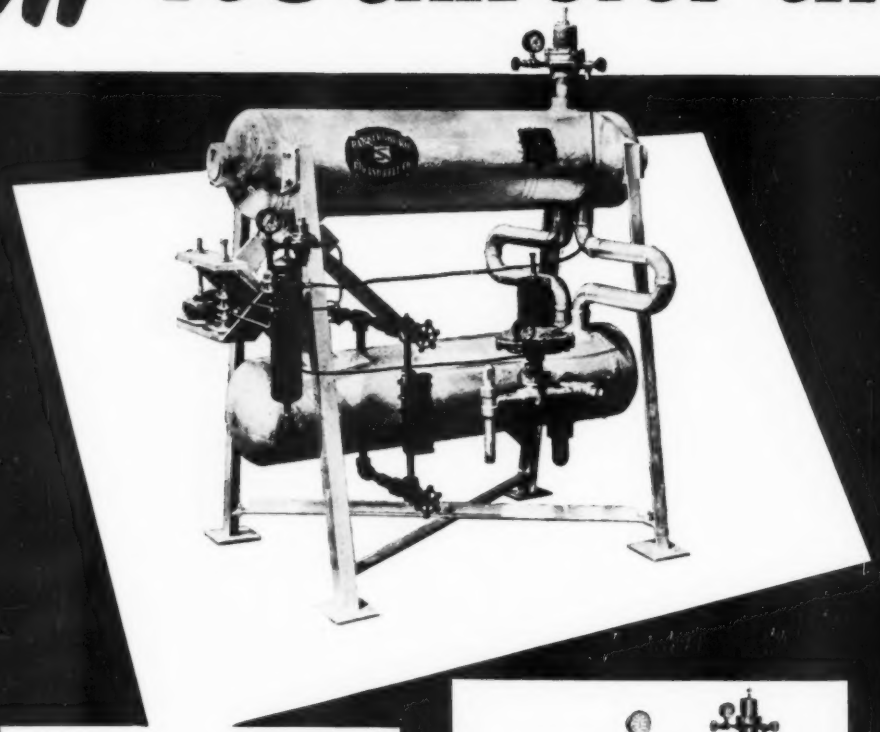
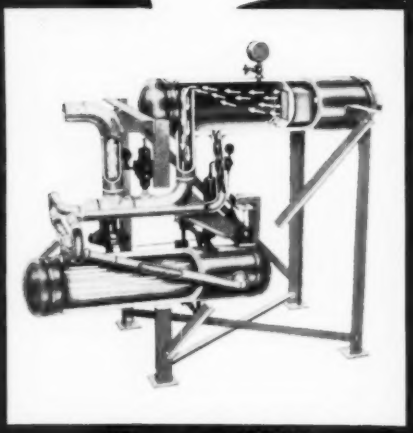
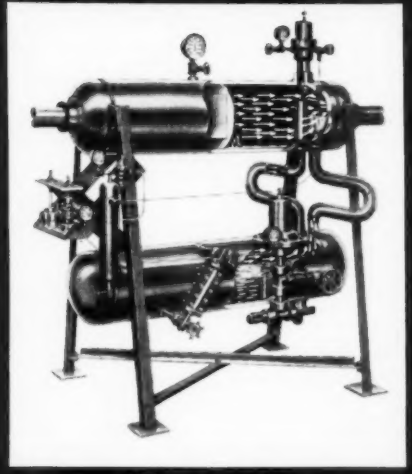




Type "W" HYDRACEPTER

for removal of water only.

This type permits all hydrocarbons, both liquid and gas, to flow on to the plant or separator. It is designed for use in lines supplying cycling or gasoline plants, or where scattered wells feed into a central separation or dehydration plant. This type will completely remove salt water from lines supplying gasoline and cycling plants.



Type "L" HYDRACEPTER

for removal of all liquids.

As a self-dumping line scrubber, this type removes any liquid accumulation from the gas lines. It can be installed at line level, eliminating the necessity of bringing the line out of the ground. Gas enters upper chamber at left and passes through scrubber. The water-laden condensate flows through one of the pipes connecting the settling chamber, where additional separation takes place. The water-free condensate returns through the other connecting pipe to the upper vessel, and then on down the gas line.

LINE FREEZING-COLD!

PARKERSBURG HYDRACEPTER IS AN ENTIRELY NEW PIECE OF EQUIPMENT ENGINEERED COMPLETELY FOR ITS JOB . . . *THE REMOVAL OF FREE WATER FROM GAS LINES AND INCREASED RECOVERY OF CONDENSATE FROM THE GAS.*

The removal of free water from gas lines insures freedom from hydrate troubles even in the coldest weather. While removing this water from the gas stream ahead of the choke, it is frequently possible to materially increase the recovery of condensate from the gas, due to lowered separator temperatures. A Parkersburg sales engineer will gladly analyze your specific problem.

For years, devices have been used in the oil field to remove water from oil and gas lines. But with the advent of high pressure gas production, something new had to be developed to meet the problems involved in the handling of this gas. The old scrubbers or water knock-outs, which had been in such wide usage, simply would not do the job.

Consider the problems encountered in the operation of a free water knockout on a line carrying high pressure gas, water and condensate.

BUILT-IN PILOT GAS SUPPLY

First, low pressure pilot gas must be supplied. With the development of the exclusive Parkersburg Non-Freezing pilot supply regulator, the necessity of pilot gas pipe lines or pilot gas heaters was obviated.

NO LIQUID AGITATION – NO INTERFERENCE TO FREE SETTLING

Second, water and condensate must be separated from the gas, and then allowed quiet settling time for the separation of the two liquids. The Hydracepter solves this problem by the concurrent use of two vessels; the upper separates gas and liquids, the lower provides quiet settling of the water from condensate. There is no gas passage through this settling chamber to cause agitation . . . there are no baffle plates to interfere with free gravity separation.

Next, the water-free condensate is returned to the line from the lower vessel. An exclusive design allows this to be done without the use of a choke or any other device to interfere with the free flow of gas and water-free condensate.

ECONOMY OF DESIGN

Finally, a positive method must be provided for controlling the dumping of water alone from the lower settling vessel. Older, low pressure water knock-out devices used some internal float arrangement to control the interface between the water and oil. The large vessel diameters required for the operation of such floats were economically feasible for low pressures. But when the water knock-out is used on high pressures, the opening in the vessel required for the insertion of the float—large or small—becomes a costly problem. To eliminate this problem, the Hydracepter is designed so that the entire lower vessel serves as an interface float, thus eliminating the need for any internal float. This insures positive interface control, and permits the use of correctly sized small vessels even at extremely high pressures.

To fully appreciate the economies made possible by this design, compare a 3000 lb working pressure Parkersburg Hydracepter with conventional water knock-outs having internal floats.

For data on water in natural gas, complete information on Parkersburg Hydracepter and the type Hydracepter required for your special problem, write or call today for bulletin HY-549.

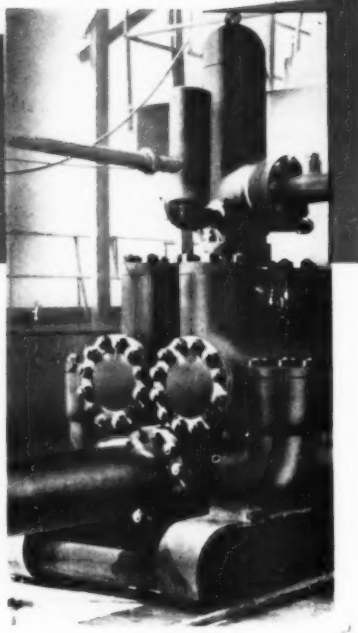
THE PARKERSBURG RIG & REEL CO.

PARKERSBURG, WEST VIRGINIA

No. 4908

PARKERSBURG

"WE'RE CHANGING OVER TO FALCON LINERS AND RODS"



FIELD TESTS TELL THE STORY!

There's only one way to prove the life of a Slush Pump Liner or Rod and that is to test it out. We have always invited side by side field tests of Falcon Products. On the outcome of such comparisons operators everywhere are learning that *FALCON PRODUCTS LAST LONGER.*

You'll reduce down time and drilling costs when you specify FALCON Slush Pump Liners and Rods.

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Well Repair in Tarakan

(Continued from page 159)

by side make further washing over impossible. The isolated part of the casing is caught by means of a releasing overshot.

If these pipes were indiscriminately pulled, the scrap in the bottom end would drop out and be a great obstruction to further operations. The top part of the string is therefore very carefully pulled up for 20 to 25 cm. and, by repeatedly carefully rotating and settling the casing it will be partially closed by one or more of the shreds. Washing over is effected 10 to 15 m. below the point of damage.

After an impression has been taken and any residual scrap has been removed by fishing, the top of the damaged casing is milled to measure with a female milling tool and the damaged pipes unscrewed with aid of a left-hand die collar. The cement column, situated directly below the washover string, prevents the pipes from becoming unscrewed below this point.

Immediate reconnecting cannot as a rule be effected, as the damaged tubing, which usually still has sucker rods inside, now projects above the remainder of the string. Only after this has been removed can the casing be repaired. Fishing for tubing is usually effected with a left-hand die collar or tap.

The recovery of wedged-in sucker rods entails special difficulties. If an ordinary sucker-rod catcher or a mouse trap is used in fishing, the sucker rod is pulled apart or pinched off while under stress. Experience has shown that the remainder of the stressed sucker rods will become spirally distorted by springing back after parting. To avoid this in Tarakan the sucker rods are unscrewed. For this purpose use is made of a left-hand sucker-rod catcher fitted with wedge blocks having knives with a left-hand thread.

Underreaming

Since the diameter of the washover string is normally about 4 in. larger than that of the casing to be washed over, wells that have been entirely washed over need to be thoroughly underreamed and flushed with water; otherwise, owing to the low formation pressures, the productivity of the wells would be greatly impaired by penetration of mud.

Instead of an underreamer a bit with a "side outlet" is being used in Tarakan. This tool is an ordinary pointed bit, the mud holes of which are nearly perpendicular to the sides. If a pump of high capacity is used a very powerful jet is directed to the wall of the bore hole, the loose sands disintegrating very rapidly under the action of the jet. The results of this method are excellent.

TEMBLOR SAND
IN RAISIN CITY FIELD
FRESNO COUNTY, CALIFORNIA

Mud (Gel, Quebracho): R_m = 3.5 ohms at BHT
Bit Size: 7⅞"
Spacings: AM = 10'
AO = 10'
AO' = 19'

This is another in a series of interpreted electrical logs from identified formations and fields which Schlumberger will reproduce in this publication. If you would like to keep this entire series, please write to us on your letterhead and we will be glad to send you a reprint of this log (and preceding logs in this series) with a binder in which you may file subsequent logs as they are published. This series is made possible through the courtesy and cooperation of the oil operators who have released these logs.

LOG ANALYSIS

1) Water saturation S

In level A, comparison between the medium and long lateral will lead one to take for R_t an approximated value of 10 ohms.

Resistivity at water level R_o = 1 ohm in neighboring wells.

$$S = \sqrt{\frac{1.0}{10.0}} = 32\%.$$

2) Formation water resistivity R_w

$$SP = -70 \log_{10} \frac{R_m}{R_w} = -105 \text{ mv.},$$

thus, $R_w = \frac{3.5}{31.7} = .11$ ohm BHT,

or 2500 G/G of NaCl.

3) Porosity p

$$F = \frac{R_o}{R_w} = \frac{1.0}{.11} = 9.1$$

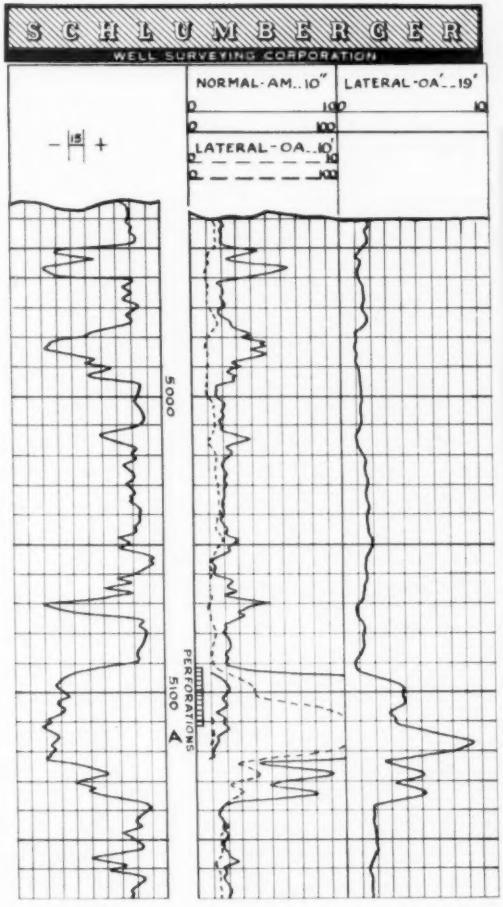
$$p = \sqrt[m]{\frac{1}{F}} = 29.5\% \text{ for } m = 1.8$$

CORE ANALYSIS

Average Porosity	27 to 34%
Water Salinity	2500 to 2700 G/G (Grains per Gallon)
Average Permeability	500 to 1500 md.
Residual Fluids	5 to 11% oil, 30 to 85% water

PRODUCTION RESULTS

Perforated	5092 to 5112
Flowed Est.	200-250 B/D, 20 API



SCHLUMBERGER
WELL SURVEYING CORP.
HOUSTON, TEXAS

Training and Care of Indonesian Employes

(Continued from page 160)

will accrue chiefly to the Indonesian employes.

Better housing is one phase of this postwar program. SVPM has spent between 15 and 16 million dollars on improved employes housing alone since repossession of its properties in 1946. Medical care and improved sanitation methods are upgrading the health of workers and all others who live in the refinery and oil-field areas. Training, offered in a variety of skills, is fitting many Indonesian workers to fill better jobs at higher pay. Food is being brought in by the company and sold at subsidized price well below the inflationary levels which prevail. Clothing and other necessities, as well as many nonessential articles which up until recently could not be obtained locally, are now available in company tokos (stores). Employe schools are teaching English to adult Indonesians and Malay to Americans and Hollanders. Other schools, provided by the company, educate the children of all races, colors, and creeds. Recreation facilities of many kinds are provided.

SVPM's motive in implementing these projects for the employes and their families is far from paternalistic. The company firmly believes there is a direct connection between the general welfare of its workers and an increased output of petroleum products.

Resuming its prewar position as the largest American-owned producing and refining company in the Far East has been a sharp struggle for SVPM, complicated by heavy war damage to its installations and by the postwar political unrest in Indonesia. The first company survey party returned to the Palembang properties with Allied troops in October 1945, nearly 4 years after the refinery and pipe lines had been destroyed and wells plugged. They found the original destruction wrought at that time had been augmented by Japanese neglect during their occupation. On top of that, the efforts of the Japanese to get the refinery back on stream had been largely wiped out by Allied bombing toward war's end.

When SVPM was able to start actual reconstruction in the fall of 1946, its prewar housing units and other employe facilities at the refinery were either run down to the point of ruin or had been occupied by the military. In addition, former employes who were still in the area were in dire need of food and clothing.

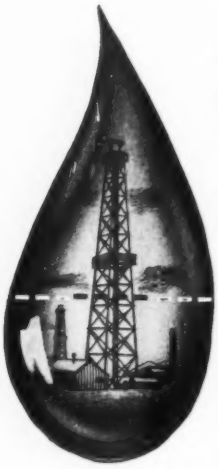
The company began in import food and clothing and to distribute them to employes at low prices in partial payment of wages. This move had an almost immediate effect on health and morale, and, in addition, proved to be a deterrent to local profiteering. Gradually the wells and pipe lines were reconditioned, and the refinery was repaired. In October 1947, oil again began to flow from the fields, and the Sungei Gerong plant went back on stream.

In the meantime SVPM had started formulating a long-range building program designed eventually to provide permanent housing for a majority of the personnel of its administrative and refinery staff at Sungei Gerong and for production employes in the oil fields some 80 miles farther inland. Despite great difficulties in procuring materials and preparing suitable land, this housing plan has been pushed well beyond the blueprint stage, and the initial steps have already been passed.

In the refinery area the program called for the rebuilding of prewar housing and the construction of new units, along with the expansion of recreational facilities and community service buildings. Accordingly, all usable prewar houses have been reconditioned and 122 completely new units built. This work was rushed to help accommodate returning technical personnel from Europe and America, who arrived back at Sungei

First in

CANADA'S OIL FIELDS



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Gerong to find available housing badly overcrowded. The new houses were erected on 80 acres of ground that first had to be hydraulically filled, at a cost of $7,500 an acre.

Next on the schedule is the construction of a new residential section for Indonesians which eventually should provide improved modern dwellings for most of the refinery workers and their families. Four hundred acres of jungle-covered land adjacent to the plant have been purchased, cleared, and graded. Construction contracts for the first house units have been let. Roads will be built and utilities installed. A mosque for Mohammedan employes and a church are to be erected. Indonesian schools, a new employe clubhouse, a training center, markets, recreation fields, and a restaurant are projected. To conform to local customs, a waterway from the nearby river will be deepened and widened to extend into the new housing area, providing access to the community for sampans and other small river craft used by merchants.

Early this year, as soon as materials became more readily available in Sumatra, masonry-type houses began to replace wooden construction at the refinery. These houses are better able to withstand the tropical climate, are easier to maintain, are more sanitary, and have a longer life. By using standardized concrete forms and by pouring walls in place through a special process utilizing aerated sand and cement, without gravel, construction goes much faster.

However, upcountry at Pendopo, the wooden prefabricated house with a metal roof continues to be the most practical answer to field-camp housing problems. Since early 1948 this type of structure has been imported from Singapore in three types of floor plan, and gradually has replaced the postwar temporary housing made from a native material called "atape." As a start on providing better housing for the men, women, and children under the company's care in the producing fields, 660 families have so far been provided with the prefabricated units, at an over-all cost of $2,500,000. An additional $1,750,000 has been spent on reconditioning prewar buildings. New churches, schools, clinics, and recreational facilities have also been built. As a general average, SVPM has found that the cost of a bare house in 1948 was four times the cost in 1940.

In recent months the food situation has improved somewhat, but supplying employes with food and other commodities continues to be a major problem. While some locally grown produce is available and is purchased by the company for resale at low prices in its own stores, the individual employe finds high prices a major barrier in his dealings with the local merchants. In July 1948, retail prices for 19 basic food items in Palembang markets showed a 17-fold increase over July 1938 prices. However, this rise has been largely offset for the SVPM employes by the company's efforts to make foods and other commodities available at reasonable prices.

SVPM's system of issuing rations was developed in consultation with local Indonesian authorities. Three ration groups were established in the employe community, based on income levels. Through its community service department, SVPM imports, stores, and distributes an average of 700 tons of food supplies and other commodities each month.

Ration issues of staple goods go to each employe twice a month, at prices reduced by company subsidy. In a recent month more than 17,500 of these composite rations were issued. To supplement this basic supply, the company-operated commissaries, or "tokos," supply some 16,000 customers a month with canned goods, frozen meats, toilet articles, clothing, and dry goods at unsubsidized prices which, through quantity buying and shipment, are well below open-market prices in the same area.

To carry on this large-scale grocery and department store business, SVPM handles in an average month such quantities as 480 tons of rice, 60 tons

LORAIN MULTI-FUEL ENGINES give you 6 big advantages

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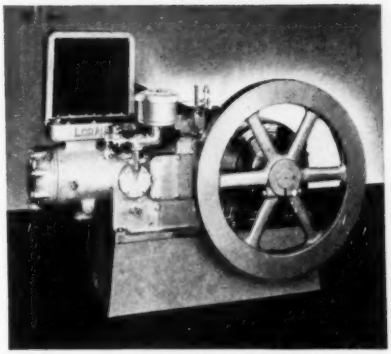

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Speed Range RPM	300-600	240-480
Rated Horsepower	10.7-21.4	17.2-34.3
Over-all Height	53"	59"
Over-all Length	72"	88"
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Approx. Shipping Wt. (Export)	3050 lbs.	4500 lbs.

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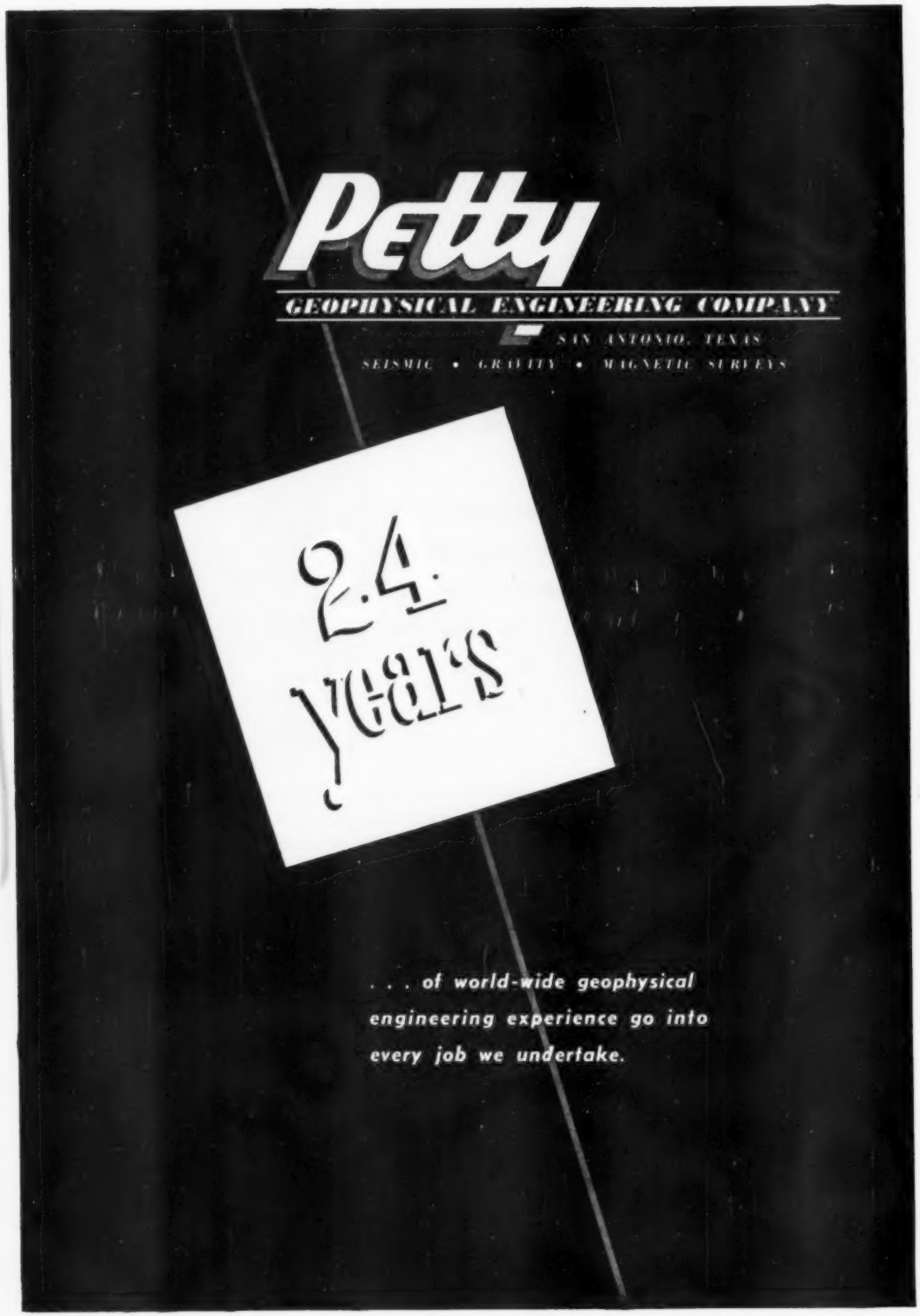
LORAIN, OHIO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of sugar, 130,000 yards of textiles, 120,000 packs of cigarettes, 17,000 razor blades, and 32,000 bars of laundry soap. The importation of such items by the company exerts a steadying effect on prices in the Palembang stores.

In the postwar period SVPM has found an increased desire on the part of its employes to acquire new skills and additional schooling. To supplement its on-the-job training program and technical refresher training in the United States, the company began in 1948 to step up its activities in training adult employes and educating their children.

Today, the company operates 13 schools for the children of employes, each with its own school board. There are now 2,600 children enrolled under 60 trained teachers, and more instructors are being trained under company-sponsored courses.

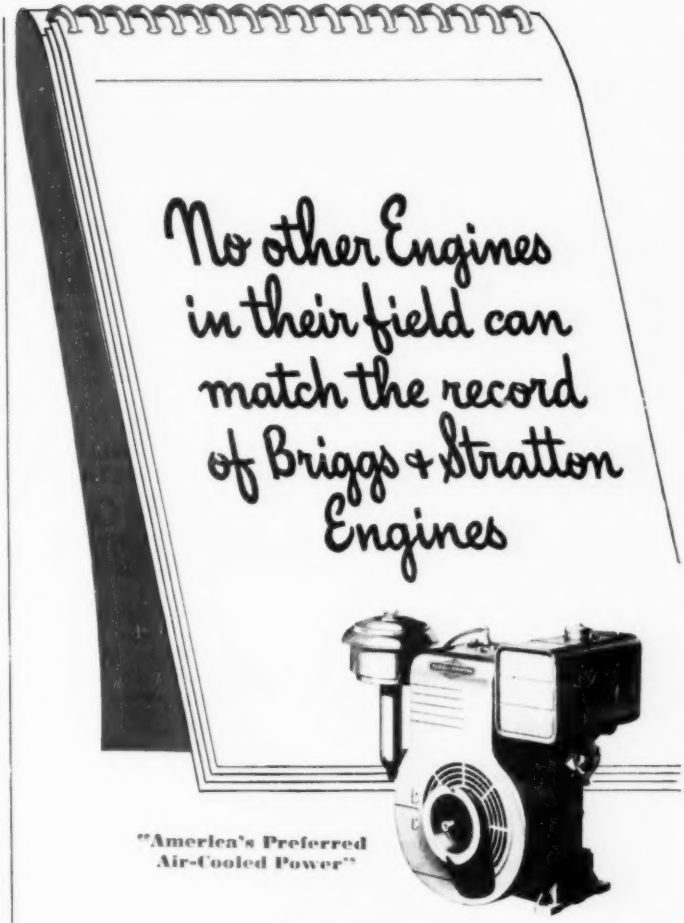
SVPM's training division program for adult employes is designed to increase and upgrade the supply of skilled and semiskilled labor and to raise the employe's earning capacity. In June of this year there were 897 employes voluntarily enrolled in 54 classes in the English and Indonesian languages, literacy courses, arithmetic, typing and shorthand, surveying, pipe fitting and welding, motor-vehicle driving, and laboratory procedure. The English courses are the most popular, having an enrollment of nearly 350 students. Classes are held in the training center at Sungei Gerong refinery and at Pendopo field camps. Supervisory training is being planned for foremen.

Future training division plans include a 4-year apprentice program for mechanical trades and process operations, with preference given to members of employe families. The schedule calls for 6 months of classroom work in literacy, mathematics, science, English, refinery-process methods, and mechanical work. The apprentices will then spend 18 months partly in the classroom and partly on rotating assignment to a craft or process unit. The final 2 years of the program will be spent in a craft or process unit with 2 hours per day of special classroom training.

The effect of SVPM's enlarged training effort can be seen in a recent literacy survey taken among the refinery workers. Out of a total of more than 5,500 employes checked, 3,590 are now literate. While this showing cannot be entirely credited to the company's training efforts, it is gratifyingly high, compared with the general average for the country.

SVPM's medical and sanitation organization, which was modern and well equipped before the war, is steadily growing. Its work aims at thorough medical care for the employes and includes long-range programs of preventive medicine which will also benefit large areas of the local population.

Two hospitals, one at the refinery



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and one in the producing fields, now have a staff of 115, including 7 doctors and 50 trained nurses. This staff handles a monthly average of 160 "in" patients and over 16,000 dispensary and clinical visits. In a recent month 122 operations were performed. A complete medical check is given to all prospective employes, and periodic inoculations of the entire employe family against smallpox and other communicable diseases are provided. Doctors are kept at peak efficiency by professional refresher training in America and Europe.

Sanitation is maintained at high levels by special squads which constantly check the water supply, garbage-disposal methods, sewage disposal, and general grounds maintenance. The inspection of food supplies and of incoming ships is also a regular operation. Drainage, mosquito control, larvicide and insecticide spray schedules, and DDT fog-generator spraying of homes are routine.

Recreation for the employe population poses a problem because of the diversity of backgrounds and interests involved. However, today a variety of activities is possible through facilities furnished by the company. Sports include soccer, tennis, badminton, boating, field hockey, swimming, golf, volleyball, and bowling. Libraries, stage productions, musicales, movies, dances, and other social gatherings are likewise popular. At Sungei Gerong there are two active clubs, the Social and Sports Association with over 600 members, and Perasos Club has 1,200 members.

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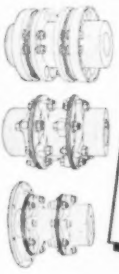

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Construction of Europe's Largest Refinery

(Continued from page 163)

be provided by a new boiler plant capable of producing 380,000 lb. per hour. No electric generating plant is planned, as purchased electric power will be provided by the nationalized power grid serving that area.

Following an efficient modern trend, maintenance and repairs will be centralized in one large building which will house workshops, store rooms, and changing and locker facilities for employes. This 800 by 140-ft. structure will be fully equipped for handling all varieties of light and heavy refinery maintenance jobs, plus a limited amount of marine repair functions. Fabricated by Austin Engineering and now under construction by Foster Wheeler, it will serve initially as storehouse and workshop during construction phase.

A total of 4,100,000 bbl. in new storage capacity will be added to the existing storage facilities for 1,500,000 bbl. of crude and products. All new crude-storage tanks will be of floating-roof design.

Over 90 per cent of products will move from the plant by water transportation. To handle incoming crude and outgoing product shipments, three new jetties will be built, each capable of berthing the largest tankers now in service. The existing dock will be used mainly for loading coastwise vessels and barges. Provisions are made for future expansion of these marine facilities. For rail movement of supplies and products, a total of 3 miles of railroad trackage, comprising a spur into the plant area and eight lines of siding for tank car loading racks, is being laid by British Railways. Over 5 miles of hard surface roads will be laid in the site.

Project Nationally Important

Fawley will contribute measurably to Britain's effort to correct her present trade imbalance. The project therefore carries a note of urgency, and adherence to the construction schedule which calls for completion early in 1952 is given high priority. With the exception of equipment items which only American manufacturers can fabricate, or deliver to conform to the erection schedule, all materials and equipment going into the plant will originate in the United Kingdom. This fixed policy of the company will demand maximum possible employment of national labor, contracting, and manufacturing facilities.

Foster Wheeler Corp. is the primary contractor for the entire project. The principal subcontractor at this early stage of grading, boring, camp construction, etc., is Wimpey, Ltd. The preliminary stages of preparation will be nearing completion at the end of this year.

Cost-imating

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

Current Itemized Indexes

(1946 = 100)

	1947	1948	Month	1949	Reference	Complete index appears in Cost-imating
Labor:						
Skilled construction	112	125	Nov.	137	E.N.R.-McGraw-Hill, New York	No. 55—Nov. 3, 1949
Common	115	131	Nov.	143	E.N.R.-McGraw-Hill, New York	No. 55—Nov. 3, 1949
Refinery construction	113	128	Nov.	140		No. 61—Dec. 15, 1949
Refinery operation	109	126	July	135	Survey of Current Business	No. 55—Nov. 3, 1949
Equipment or materials:						
Board, insulation, 48-in.	112.5	125	Sept.	125	Code 561, Wholesale Prices	
Boiler tubes, 2-2¼-in. composite)	115	*135	Sept.	138	Code 409.2, Wholesale Prices	
Brick and tile composite	114	137	Sept.	132	Wholesale Prices, B. of Labor Stat.	No. 22—Mar. 17, 1949
Brick, common	110.5	127	Sept.	133	Code 498, Wholesale Prices	
Brick, fireclay	114	126	Sept.	131	Code 499, Wholesale Prices	
Building materials composite	135.5	153	Sept.	143	Wholesale Prices, B. of Labor Stat.	No. 22—Mar. 17, 1949
Castings, gray iron	118.5		Sept.	165	Code 416.4, Wholesale Prices	No. 46—Sept. 1, 1949
Castings, pipe	129	*130	Sept.	171	Code 434.1, Wholesale Prices	No. 46—Sept. 1, 1949
Cement	111	125	Sept.	128	Code 509, Wholesale Prices	No. 22—Mar. 17, 1949
Compressor	114	*128	Nov.	117	Manufacturer	No. 36—June 23, 1949
Engines (composite)	*109	*120	Nov.	110	Manufacturer	No. 36—June 23, 1949
Gas	*111	*122	Nov.	110	Manufacturer	No. 36—June 23, 1949
Diesel	*108	*117	Nov.	110	Manufacturer	No. 36—June 23, 1949
Exchangers	*115	*130	Year	*128		No. 2—Oct. 28, 1948
Instruments (composite)	113	*120	Nov.	123	Manufacturer	No. 34—June 9, 1949
Flow meter, mech.	102		Nov.	109	Manufacturer	No. 34—June 9, 1949
Flow meter, air control			Nov.	132	Manufacturer	No. 34—June 9, 1949
Flow meter, remote			Nov.	130	Manufacturer	No. 34—June 9, 1949
Potentiometer, 6-pt.	111		Nov.	126	Manufacturer	No. 34—June 9, 1949
Potentiometer, air control			Nov.	132	Manufacturer	No. 34—June 9, 1949
Pressure controller			Nov.	130	Manufacturer	No. 34—June 9, 1949
Pressure gage	109		Nov.	100	Manufacturer	No. 34—June 9, 1949
Thermometer, recording			Nov.	118	Manufacturer	No. 34—June 9, 1949
Control valve	117		Nov.	130	Manufacturer	No. 34—June 9, 1949
Insulation, asbestos pipe	118	122	Sept.	130	Code 767, Wholesale Prices	
Lumber (composite)	155	175	Sept.	157	Wholesale Prices, B. of Labor Stat.	No. 7—Dec. 2, 1948
Cypress, C grade	155	178	Sept.	247	Code 529-2, Wholesale Prices	
Pine, Ponderoso No. 3	140	176	Sept.	144	Code 524-1, Wholesale Prices	
Pine, yellow timbers	138	161	Sept.	155	Code 522-9.1, Wholesale Prices	No. 7—Dec. 2, 1948
Redwood, heart	134	*159	Sept.	*158	Code 528-3, Wholesale Prices	
Paint and P. materials (composite)	137	135	Sept.	121	Wholesale Prices, B. of Labor Stat.	No. 22—Mar. 17, 1949
Paint, inside, flat	133.5	137	Sept.	143	Code 531.1, Wholesale Prices	
Paint, outside	150	*156	Sept.	146	Code 532, Wholesale Prices	
Pipe, sewer	111.5	121.5	Sept.	115	Code 572.1, Wholesale Prices	No. 22—Mar. 17, 1949
Pipe, black, ¾-in.	120.5	*148	Sept.	152	Code 435, Wholesale Prices	No. 42—Aug. 4, 1949
Pumps (composite)	119.6	131.6	Nov.	132.8	Manufacturer	No. 29—May 5, 1949
Pumps, centrifugal (comp.)	*109	*120	Nov.	120	Manufacturer	
Pumps, reciprocating (comp.)	130.1	143.1	Nov.	144.7	Manufacturer	
Sand	112	122	Sept.	128	Code 579, Wholesale Prices	
Steel (composite iron and steel)	121	140.5	Sept.	149	Wholesale Prices, B. of Labor Stat.	No. 61—D c. 15, 1949
Steel plate (tank)	117.5	*144	Sept.	143	Code 446.2, Wholesale Prices	No. 5—Nov. 18, 1949
Steel sheet, galvanized	105	*146	Sept.	134	Code 448.1, Wholesale Prices	
Steel, structural	113.5	*145	Sept.	151	Code 452, Wholesale Prices	No. 18—Feb. 17, 1949
Marshall-Stevens indexes:						
Process industries (average)	121	131.5	Sept.	130.5	Chem. Eng., October 1949	Chem. Eng., Nov. 1947
Chemical	119.5	130	Sept.	129	Chem. Eng., October 1949	Chem. Eng., Nov. 1947
Petroleum	121	132	Sept.	131	Chem. Eng., October 1949	Chem. Eng., Nov. 1947
Electrical power	122	135	Sept.	134	Chem. Eng., October 1949	Chem. Eng., Nov. 1947
Refrigeration	129	141	Sept.	138	Chem. Eng., October 1949	Chem. Eng., Nov. 1947
Steam power	122	132	Sept.	131	Chem. Eng., October 1949	Chem. Eng., Nov. 1947
Nelson—Refinery Construction	117	132.8	Sept.	140.6		No. 61—Dec. 15, 1949

*Estimate.

No. 62 in a series by W. L. Nelson, professor of petroleum refinery engineering, University of Tulsa

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ENGINEERING *fundamentals*

Index to Series on Reservoir Engineering

In response to a continuing demand for the installments of "Engineering Fundamentals," the individual page units of the series have been reprinted in the form of two separate manuals, for the use of new subscribers to The Oil and Gas Journal who have not received the issues in which the material was first printed.

The No. 1 manual includes the installments from 300 to 345, inclusive; the No. 2 manual contains installments 346 to 385, inclusive. These Engineering Fundamentals manuals sell for $1.00 each and can be obtained by sending check to Reader Service Department, The Oil and Gas Journal, P. O. Box 1260, Tulsa, Okla.

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Series by Dr. John C. Calhoun, Jr., Chairman, Petroleum Engineering School, University of Oklahoma

QUESTIONS on TECHNOLOGY

by W. L. Nelson
Consulting Engineer

History of Octane Number

When was octane number developed and what changes have occurred?—E.O.G.

The following is a chronological story of octane number developments as applied to automotive vehicles:

1925-1928—Discernible knock was detected by stuffing cotton in the ears and listening to the engine. All sorts of engines were used among which were modifications of the Delco-light engine (S.A.E. Journal, February 1927, p. 214, and March 1927, p. 405). Benzol equivalents using several straight-run fuels as the high-knock component of the blend were extensively used. When using the following straightrun fuel—60.6° A.P. I., 120° F., initial, 10 per cent point 182° F., 20 per cent point 215° F., 50 per cent point 286° F., 90 per cent point 390° F., and end point 421° F.—the relation of benzol equivalent to octane number (motor method) was as shown in Table 1 (Hubner and Murphy, *The Oil and Gas Journal, April 30, 1931, p. 22)*:

TABLE 1—BENZOL EQUIVALENTS

Octane No.	Benzol equivalent
0	−38
30	8
40	25
50	36
60	47
70	56
80	64.5
90	72
95	75.5
100	80

1929-1930—Isooctane and heptane were tentatively adopted as standard reference fuels (Boyd, T. A., Progress Toward a Uniform Method of Measuring Detonation, A.P.I. meeting, Chicago, November 12, 1930) although isooctane had been suggested in 1927 by Edgar in Ind. Eng. Chem. 19, 145 (1927) and 20, 245 (1928). The Series 30 and 30B engines of Ethyl Corp. were widely used *(The Oil and Gas Journal, March 6, 1930, p. 190*—Nat. Pet. News, Feb. 19, 1930, p. 24) and by late 1930 over 2,000 samples had been tested and by April 1930 over 110 Ethyl engines were in use.

The C.F.R. (Cooperative Fuel Research) engine was proposed by T. A. Boyd representing the S.A.E., A.P.I., National Automobile Chamber of Commerce, and the U. S. Bureau of Standards. The research method (600 r.p.m., jacket temperature 212° F., and fuel mixture at about 100° F.) was first used.

According to W. W. Scheumann, Octane Number the Refiner's Will-o-the-Wisp, Refiner, April 1940, p. 62, the situations between 1931 and 1939 were:

1931—Method published by Cooperative Fuel Research Committee. Road tests showed cars rated fuels at considerably lower octane-number levels than the laboratory method.

1932—Because the research method gave numerical values far too high, the first Uniontown tests were conducted and the motor method (900 r.p.m., jacket 212° F., mixture 300° F.) was developed by the Cooperative Fuel Research Committee so that average road octane numbers would approximate laboratory octane numbers of average motor fuels.

1933—In spite of the vigorous protests of many refiners, who objected to the lower numerical values, the motor method quickly replaced the research method. The motor method was adopted by A.S.T.M. and was the only knock test method to be so acknowledged in 1933.

1934—A second series of Uniontown tests revealed the fact, long suspected, that the motor method did not rate fuels exactly as average cars on the road rated average fuels. The cars indicated the fuels had slightly higher octane numbers than the motor method suggested. But the research method was so far removed from the road octane numbers that it was not seriously considered in 1934.

1936-1937—The licensees of Ethyl Gasoline Corp. developed the L-3 method as a laboratory method which would give numerical values approximately 30 per cent of the way from the motor method toward the research method. It is noteworthy that the objective was to go less than one-third of the way toward the research method and further that there were a few units in the industry who preferred to adhere to the motor method rather than to indulge in a constant changing of knock-test methods which vainly attempted to match the mythical average fuel to the mythical average car, in average condition and adjustment, driven by the average man under the average balance of starting, acceleration, low and high-speed driving in average weather conditions at the average altitude.

1939—The Cooperative Fuel Research Committee standardized and modernized the old (1931) research method and for preciseness called it the 1939 C.F.R. research method. The method was developed as a research tool. It is significant that by general consent the method still was not forwarded to A.S.T.M.

1940-1946—Few developments occurred in automotive methods but methods for aviation fuels underwent rapid development. The 1-C and 3-C aviation methods were used during the war and in about 1947 A.S.T.M. adopted somewhat similar methods known as the F-3 and F-4 methods.

1947—The 1939 C.F.R. research method was adopted as the Tentative F-1 method (D-908) perhaps because this method favors catalytic gasolines.

1948—The standard methods today are the following A.S.T.M. methods (A.S.T.M. Manual of Engine Test Methods for Rating Fuels, March 1948, and an Appendix to the Manual issued in December 1948):

D-357-48 Knock Characteristics of Motor Fuels by the Motor Method.

D-908-48T Knock Characteristics of Motor Fuels by the Research Method (Tentative).

Two tentative aviation fuel methods, D-614-48T and D-909-48T (supercharge).

Colored Asphalt

We hear that colored asphalt is being made in Europe. Can you tell us of this?—F. N. P.

To the knowledge of this department, no methods of coloring black asphaltic materials have been suggested. The rumor about colored asphalt probably arises from the manufacture of resinous colorless binders which, of course, can be colored with dyes or whitened by the use of calcined flint or similar agents. These developments are reported in the October 1949 issue of Petroleum (London). It is said that the cost is scarcely larger than the cost of bituminous asphalts.

TABLE 2—METHODS OF OPERATION OF AUTOMOTIVE OCTANE NUMBER TEST ENGINES

	Ethyl Series 30	C.F.R. Research	C.F.R. Motor	Ethyl L-3	Army Air Corps	A.S.T.M. F-1	A.S.T.M. F-2
Operating conditions—	1930	1931	1932	1936	1935*	1939	1947
Engine speed, r.p.m.	900	600	900	900	1,200	600	900
Air intake temperature, °F.	110-115					125	75-125
Mixture temperature, °F.		atmos.	300	260	100		300
Cooling jacket temperature, °F.	345	212	212	212	330	212	212
Spark advance, degrees			26	16		13	19-26

*Approximate date, and the method is used mainly for aircraft fuels.

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PIPE LINES

Great Lakes Takes Bids For 290-Mile Project

Great Lakes Pipe Line Co. is reported to be preparing to let contracts for 290 miles of 12-in. consisting of 203 miles between Barnsdall, Okla., and Kansas City; 54 miles between Ponca City, Okla., and Barnsdall; and 33 miles between Tulsa and Barnsdall. Bids were received December 21. Construction is to start between January 5 and 10 for work to be carried on through the winter. This is part of the $50,000,000 expansion program announced last summer.

Work is going ahead at all spreads working on the 261-mile, 12-in. line from Des Moines to Minneapolis where operations were interrupted during the steel strike.

Gulfcoast Northern Co. Joins in Chicago Project

The 1,400-mile gas pipe line to be built from the southern Gulf Coast to Chicago by Texas Illinois Gas Pipeline Co., described in The Oil and Gas Journal, December 15, page 47, is a joint enterprise of Peoples Gas Light & Coke Co., Chicago, and Gulfcoast Northern Gas Co., Tulsa.

Each of these companies will hold 50 per cent of the stock of Texas Illinois, but Peoples Gas Light will be the active partner and will conduct the operations. Through an error it was stated that Northern Natural was participating in the project, but the reference was intended to be to Gulfcoast Northern, which previously had assembled reserves of gas which have now been assigned to the Texas Illinois company.

At one time Northern Natural Gas Co., Omaha, was interested in obtaining reserves of gas along the Gulf Coast but, as explained in the article, it is now preparing to increase its transmission of gas from the Hugoton-Panhandle region.

President of Texas Illinois is J. J. Hedrick, president of Natural Gas Pipe Line Co. of America. Gulfcoast Northern officials are: president, F. E. Stanley, Tulsa, president of Midwestern Constructors, Inc.; vice president, John F. Lynch, Corpus Christi, president of La Gloria Corp.; treasurer, Theodore Rinehart, Tulsa, of the law firm of Doerner, Rinehart & Stuart; and directors, W. G. Skelly, Tulsa, president of Skelly Oil Co.; Clyde Alexander, Dallas, president of Cresslinn Oil Co.; Ray Fish, Houston, president of Fish Engineering Corp.; Norman Kinsey, Shreveport, independent producer, and W. F. Matheny, Fort Worth.

El Paso Natural Proposes Changes in Line Facilities

An application has been filed with Federal Power Commission by El Paso Natural Gas Co. proposing changes in three previously authorized pipe-line projects in Texas, New Mexico, and Arizona, designed to carry natural gas for delivery to three utility companies in California.

As previously authorized by FPC, the facilities are to deliver 405,000,000 cu. ft. of gas daily to Southern California Gas Co. and Southern Counties Gas Co. of California; and 250,000,000 cu. ft. daily to Pacific Gas & Electric Co.

Proposed changes, El Paso said, would make these facilities better adapted for transportation of the quantities of natural gas previously authorized, and are necessary to obtain the previously authorized quantities of gas from sources of supply in Texas and New Mexico.

The additional facilities are estimated to cost $16,622,712, but El Paso said it would save $9,338,972 on facilities which would not be built under the new plan. This would make a net increase of $7,283,740 in the total cost of the three projects, which previously were estimated to cost $162,256,032.

Proposed changes involve approximately 501 miles of line, some of which would be new line not included in previous plans, and other of which would be substituted for certain sections of the line as previously authorized. Proposal also includes changes in compressor stations, purification, dehydration, and absorption plants.

Gas to be transported through the facilities would be obtained from flare gas produced in the Permian basin of West Texas and southeastern New Mexico.

Mid-Continent Expands Its Crude Pipe-Line System

TULSA. — Completion of several construction projects, together with two property transactions, have resulted in a major expansion of Mid-Continent Pipe Line Co.'s crude-oil gathering and main-line transmission systems.

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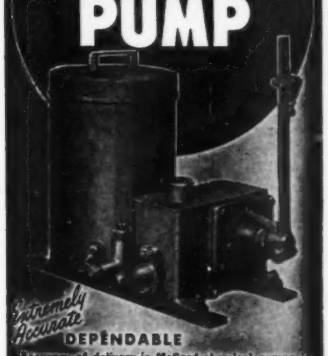

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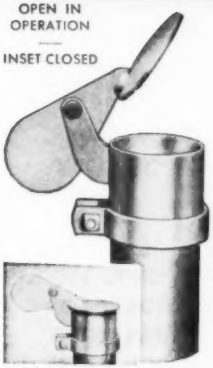

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Pipe-line connections acquired in the expansion add 5,310 bbl. per day to the crude-oil supply of Mid-Continent Petroleum Corp.'s West Tulsa refinery.

Construction just finished includes a 9-mile, 8-in. loop of one of the company's existing lines to the West Tulsa refinery, a 10-mile, 10-in. section in the same line, a new 6-in. river crossing, and 3 miles of new 6-in. line through the City of Tulsa. About 15 miles of other 6-in. line have been reconditioned.

Looping of 3½ miles of 4-in. line and 1½ miles of 6-in. line is nearly completed. In addition to the pipeline construction, two 40,000-bbl. floating-roof tanks have been erected, and new equipment has been placed in a pump station.

Gathering lines involved in the property transactions include 26 miles of Magnolia Petroleum Co. system, 27 miles of Texas Co. gathering lines, and 57 miles of new lines, constructed to tie acquired property into Mid-Continent's system. These transactions raise the company's gathering-line mileage to 1,650 miles.

Big Inch and Power Costs Are Compared at Meeting

A comparison between a 20-in. and a 10-in. trunk line, each designed for maximum efficiency, shows that the 20-in. line has four times the capacity of the 10-in. line, yet it will require a capital investment of only 75 per cent additional, H. H. Anderson, vice president and general manager, Shell Pipe Line Corp., said in discussing current trends in oil pipeline operations before a recent meeting of Petroleum Electric Power Association at Beaumont, Tex.

A 20-in. line will earn 7 per cent on the investment with a barrel-mile tariff of less than half of that required for a 10-in. line, he said. These tariffs are, of course, based on running the lines at full capacities. Anderson cited this comparison in pointing out that the fundamental trend in pipe lining is toward operating larger diameter lines.

The economic advantages of electrification are less obvious than those of large diameters. Given a standoff on the modern large stations, with electricity at 8 mills per kw. hr. and fuel at $2.65 per barrel the 10-year costs of diesel and electric motor-driven stations compare approximately as follows (The per cents refer to the same 10-year period as 100 per cent):

	Diesel per cent	Electric per cent
Capital investment	26	13
10-year maintenance expense	8	2
10-year operating cost (except fuel oil or electric power)	28	13
Fuel oil or electric power	38	72
	100	100

All costs except energy total up to

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62 per cent in the diesel stations and to only 28 per cent in the electric stations, while the electric bill is just about twice the oil bill. Anderson believes that advantages of electric equipment operation provide a margin in favor of electric power including compactness of plant, more foolproof construction, cleanliness, reliability, flexibility, and ease of control.

Another important trend is to the use of more automatic controls. Also, it is becoming imperative to use push-button actuated motor-driven valve operators that can be adapted to automatic control.

In the new Ozark System stations, the mere pressing of three buttons on the console by a single employe will perform 12 operations in 6 minutes that would otherwise take two or three husky men an hour to accomplish.

With a revenue of $50.00 per minute depending on getting the line under way the direct saving to be gained by a $10,000 investment in sequence controllers is obvious. Perhaps even more important, however, is the insurance of a foolproof job of starting. Any group of men having 12 operations to be performed in a required sequence can easily make an error that might cause an accident and further losses.

Piedmont Explains Plans For Pipe-Line System

Piedmont Natural Gas Corp. has been outlining plans to the Federal Power Commission for the construction of a pipe-line system for transmitting gas to Virginia and the Carolinas which would be in service December 1, 1950.

The line would extend 1,350 miles from Greenville, Miss., to Richmond, and Norfolk, Va. In order to complete the project in time to commence deliveries to Richmond in December next year, Robert Ducker, New York engineer, told the commission that it would be necessary to obtain a permit by March 1, 1950. Piedmont plans call for transmitting 275,000,000 cu. ft. daily.

The main line proposed by Piedmont would extend 966 miles through Alabama, Georgia, Tennessee, South Carolina, North Carolina, and Virginia. This would cross rivers including the Tombigbee, Black, Warrior, Seneca, Broad, Yadkin, Roanoke, James, Appomattox, Nansemond, and Elizabeth.

Piedmont is headed by W. P. Conyers, president, Montgomery Building, Spartanburg, S. C. Commonwealth Natural Gas Corp. is also seeking a permit from Federal Power Commission for a line which would only serve Virginia areas.

Plans are Changed for Middle East Pipe Lines

Changes in plans for construction of crude-oil pipe lines in the Middle East were reported after the article beginning on page 242 of this issue, entitled "Foreign Pipe-Line Mileage Increased by 2,650 Miles During 1949," had been printed due to the advanced schedule required for this special issue.

Present plans call for pushing ahead the construction of the Iraq Petroleum Co., Ltd., 556-mile, 30-32-in., Kirkuk-Banias line so that it will be started prior to the Middle East Pipelines, Ltd., 800-mile, 34-36-in. line from the Iranian border to a point in Northwest Syria probably near Tartus.

For the Iraq line, pipe deliveries from the United States will start in 1950; completion is scheduled for the last half of 1952. The project is to be built by American contractors.

Even with later favorable action from the Iraq Government to facilitate procuring right-of-way, the Middle East project is not expected to get under way until late in 1951.

Kuwait Oil Co. (Gulf and Anglo-Iranian) dropped plans for a line from Kuwait to a Levantine port. Pipe orders have been canceled.

The present status of Middle East pipe-line projects was discussed in "*Middle East Pipe-Line Developments*," *page 52, December 15 issue of The Oil and Gas Journal.*

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We are joined by all of our salesmen in thanking you and wishing you a very Merry Christmas and a prosperous New Year.

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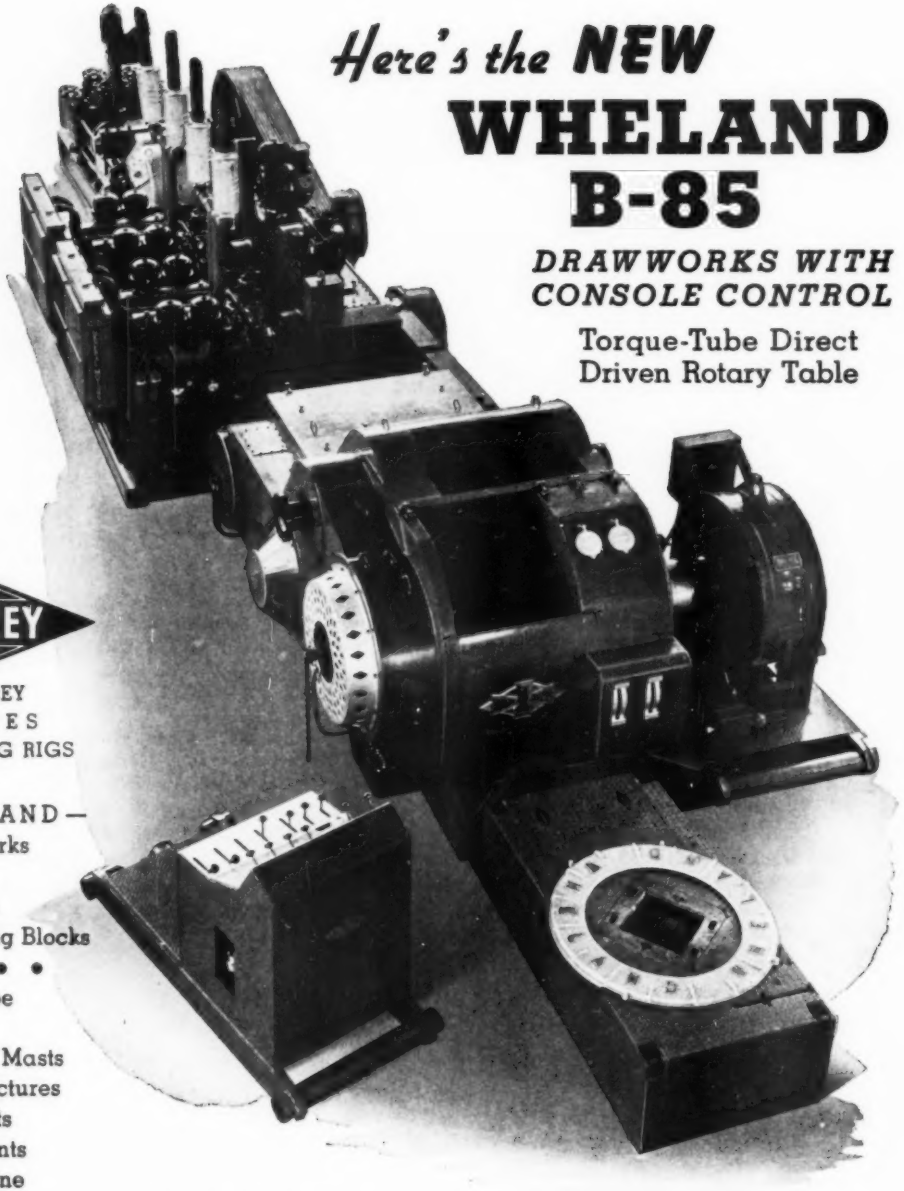

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NATURAL GAS

Michigan-Wisconsin Gas Co. Seeking to Enlarge System

Michigan-Wisconsin Gas Co., jointly with Michigan Consolidated Gas Co., has asked the Federal Power Commission to authorize construction of facilities which would nearly double the present annual sales capacity of the former company's recently completed Texas-to-Michigan natural-gas pipe-line project.

The plan seeks authorization for Michigan-Wisconsin to install 115,560 hp. of additional compressor capacity on the line, which now has an authorized compressor capacity of 21,600 hp.

The increase in horsepower rating would raise the annual sales capacity from 56,575,000,000 cu. ft. of gas, as now authorized, to a new total of 110,595,000,000 cu. ft., which is needed to meet the estimated requirements of markets which Michigan-Wisconsin is authorized to serve, the application states.

Michigan Consolidated is proposing to install facilities necessary to utilize its Reed City, Mich., field to provide additional storage capacity which Michigan-Wisconsin will require in connection with the proposed expansion of its capacity. Also proposed is construction of a 21-mile, 24-in. line from its Austin field to the Reed City field, as well as other facilities. Estimated cost of the overall project is $25,000,000 for Michigan-Wisconsin, and $4,500,000 for Michigan Consolidated.

Panhandle Eastern Tariff Hearing Postponed by FPC

A hearing scheduled to convene on December 12 in Washington, D. C., in the natural-gas tariff-suspension proceeding involving Panhandle Eastern Pipe Line Co., Kansas City, Mo., has been postponed by FPC until a date to be fixed by further order.

Postponement was made to enable parties to the proceeding to file responses to a motion of Illinois Commerce Commission, asking a 120-day recess in the proceedings. The Illinois commission's motion pointed out that Trunkline Gas Supply Co. now has an application pending before FPC proposing construction of facilities to furnish 250,000,000 cu. ft. of natural gas daily to Panhandle, thus increasing the latter firm's present supplies of deliverable gas by 50 per cent. Panhandle has renewed negotiations for service agreement with the distributing companies it now serves, the Illinois commission said.

Panhandle's proposed natural-gas tariff was submitted to FPC in June, and subsequently was suspended by the commission. An interim order in the proceeding, setting up emergency-service rules governing deliveries of gas by Panhandle during the current heating season, was issued recently. *(The Oil and Gas Journal, December 15, 1949, page 119).*

Rehearing Set by FPC on New York Firms' Proposal

Petitions for rehearing and oral argument, filed by Consolidated Edison Co. of New York, Inc., Brooklyn Union Gas Co., Kings County Lighting Co., and Public Service Commission of the State of New York, in connection with a Federal Power Commission order issued October 31 authorizing construction of integrated natural-gas pipe-line facilities in the New York City metropolitan area, has been granted by the commission.

The October 31 order denied motions to dismiss for lack of jurisdiction applications of the three firms. The petitions, all filed the latter part of November, asked FPC to enter an order abrogating its findings and order an opinion in their entirety. FPC has not set a date as yet for the oral argument.

Gas Sales, Revenue Show Gain in Third Quarter

Total revenues from sales of gas by utilities for the third quarter of 1949 were 5 per cent over the same quarter a year ago, or $297,000,000, according to a report issued recently by American Gas Association. Revenues from commercial sales represented the highest percentage gain, rising 12.2 per cent, the report showed. Residential gas revenues were up 5 per cent, and industrial gas revenues gained 2.7 per cent over a year ago.

For the 12-month period ending September 30, total revenues from utility sales of gas were $1,630,000,000, an increase of 8.7 per cent over revenues of $1,499,000,000 in the previous 12-month period.

Total revenues from natural-gas sales during the third quarter were $183,000,000, a rise of 7.3 per cent over the comparable quarter of 1948.

Federal Power Commission reported, meanwhile, that operating revenues of natural-gas companies reporting to the commission totaled $65,800,072 for the month of September, representing an increase of 11.7 per cent over the $58,928,357 reported the same month during 1948.

Gas-utility operating income for September amounted to $6,954,667, up 10.4 per cent from the $6,301,500 reported for the same month a year ago. The data was based on monthly statements filed with FPC by 83 natural-gas companies. The report showed that sales to ultimate consumers during September were 113,392,000,000 cu. ft., an increase of 2.3 per cent over the same month a year ago.

A.G.A., in reporting total sales of gas by utilities to ultimate consumers in October, stated that 2,665,170,000 therms were sold during that month, representing an increase of 12 per cent over the 2,378,766,000 therms sold in October 1948. For the 12 months ended October 31 total sales of gas amounted to 34,949,964,000 therms, an increase of 9.2 per cent, compared with 31,999,157,000 therms sold in the same month a year ago. A.G.A.'s index of gas sales for October 1949 was 228 per cent of the 1935-39 average.

Benedum Field's Two Gas Plants Almost Completed

MIDLAND. — The Benedum field, on the Upton-Reagan County line 50 miles southeast of here, will soon have two gas-processing plants in operation. The 55,000 M.c.f. plant of Slick-Urschel Oil Co. and Texas Natural Gasoline Corp. is to begin running gas through the absorbers this week. Later this month, operation of gasoline-extraction facilities will be started at the 80,000-M.c.f. plant of Plymouth Oil Co.

Both plants will operate as high-pressure absorption plants. Field gas, removed from the oil at central separator installations near the plant sites, will enter the plants at about 900 psi. Residue gas, stripped of its hydrogen sulfide content, will then be sold to El Paso Natural Gas Co. The jointly owned plant of Slick-Urschel and Texas Natural, constructed by J. F. Pritchard & Co. of Kansas City, will be operated by the latter company. Construction of the Plymouth plant is being done by Hudson Engineering Co., Houston.

Gas will be supplied largely by the 40 Ellenburger and Fusselman wells in the field. These 11,000 to 11,500-ft. wells all have high gas-oil ratios, producing extremely wet, rich gas along with the 56° A.P.I.-gravity crude. The two companies constructing the plants are the largest operators in the field, but Republic Natural Gas Co., Shell Oil Co., and Humble Oil & Refining Co. also each have several wells.

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Among the

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Warren & Bradshaw Open Offices at Oklahoma City

Warren & Bradshaw Drilling Co. and Coronado Oil Co. of Delaware have opened a joint division office in Apco Tower Building, Oklahoma City. L. L. Jones has been named general superintendent for Warren & Bradshaw and development superintendent for Coronado. Don O. Freeman is executive assistant in the office.

Hinkle Quits Contracting

Frank Hinkle, Decatur, Ill., contractor in the Illinois basin area, has sold his four rotary rigs to Reserve Drilling Co., Casper, Wyo., and is retiring from the contracting business to devote his time to his own oil operations.

Upward Trend Continues In Number of Active Rigs

The number of rotary rigs operating in the United States and western Canada continued its upward trend during the week ended December 12 (latest report), exceeding the previous week's total by 31, and setting a new high for the year. Although the Gulf Coast and West Texas-New Mexico areas accounted for most of the increase, additional activity also was reported in Oklahoma and on the Pacific Coast. West Texas, increase is largely attributed to the rapidly expanding development in Scurry County.

ROTARY RIGS IN OPERATION*

(United States and western Canada)

Area—	Week ended 12-12-49	Change week ended 12-5-49	Change week ended 12-13-48
Gulf Coast	539	+22	—101
W. Tex.-N. M.	709	+10	+ 86
Ark.-N. La.-E. Tex	159	— 2	— 20
Oklahoma	262	+ 5	— 12
Kansas	144	0	— 7
Illinois-Eastern	150	— 1	+ 18
Rocky Mountains	90	— 6	— 64
Pacific Coast	148	+ 7	— 54
Total U. S.	2,201	+35	—154
Western Canada	83	— 4	+ 5
Total	2,284	+31	—149

*Courtesy Hughes Tool Co.

Keahy Drilling Co. has moved a rig into the Moss Agate area, in Niobrara County, Wyoming, where it will drill for Wilson Oil Co. at 1 Sheaman, a Dakota sand test, projected to 2,300 ft.

Mitchell & Cage Drilling Corp., Oklahoma City, is drilling for An-Son Petroleum Corp. at an extension location, a half mile south of the Jones pool, Oklahoma County. The test, 1 Davis, in 8-12n-1e, will be carried to the Misener sand, which pro-

Day-tour crew on a steam rig which Richardson & Stewart Drilling Co., San Antonio, has working for Magnolia Petroleum Co. in the LaGloria field, located on the Jim Wells-Brooks County line, South Texas. Left to right: Ray Rue (driller), T. E. Nix, William Dailey, J. M. Coleman, and T. H. Atkins

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duces in the pool. This contractor also has another new operation under way in Noble County, where it is attempting a half-mile west extension to the Lucien pool. The latter test, 1 Whitten, in 7-20n-2w, is being drilled for its own account.

Decem Drilling Co., Oklahoma City, is rigging up for a projected 8,000-ft. test to be drilled for Stanolind Oil & Gas Co. in southeastern Stephens County, Oklahoma. The location, in 12-2s-4w, is ¾ mile north of the shallow Milroy pool and about a mile southwest of the Camp pool, where production is from a 7,000-ft. horizon.

Jones & Simpson Drilling Co., Dallas, has entered the Scurry County play with a projected 7,000-ft. test to be drilled for its own account in 244-97-H&TC Survey, 9 miles west of Snyder. The location, 1 Dee Myers, is 1½ miles north of nearest production in the Diamond-M field.

Dick Wegener, Oklahoma City, has a 4,200-ft. wildcat test under way for Murphy Oil Co. at 1 Wofford, in 22-14n-4e, 2 miles south of Chandler, Lincoln County, Oklahoma. Location is about 1½ miles northeast of the Gessman pool.

C. E. Beal Drilling Co., Tulsa, is rigging up cable tools to drill Producers Pipe & Supply Co. 1 Woods, a wildcat test in 25-14n-10e, southeastern Creek County, Oklahoma.

McIntyre & Webster are moving a rig into the Pekisko area, southwestern Alberta Province, Canada, where they will drill a deep wildcat test for Royalite Oil Co. and Socony-Vacuum Exploration Co. The location, in 31-16n-2w5, is 8 miles south of the southern limits of the Turner Valley field.

Mohawk Drilling Co., Oklahoma City, has moved a rotary rig into a location in northeastern Lincoln County, Oklahoma, 4½ miles south of Cushing, where it, in partnership with Warren Wright, will drill a Wilcox sand exploratory test. The location, in 30-17n-5e, is about 1½ miles north of abandoned shallower production in the Agra pool. Projected depth is 4,250 ft.

Pickrell Drilling Co., Wichita, drilling for itself and Franco Central Oil Co., appears to have found a new oil pool in northern Barton County, Kansas. The prospective discovery well is 1 Klug, NE NE SW 8-17-12, which on a drill-stem test of Arbuckle lime at 3,377-79 ft., recovered 15 ft. of free oil.

Clay & Gackle Contracting Co., Hobbs, N. M., is starting another well for Stanolind Oil & Gas Co. in the Bowers field, Lea County, New Mexico. It will be 4 State, located in 33-18s-28e.

Viersen-Cochran Drilling Co., Oklahoma City, has a rig running for Birmingham-Bartlett Drilling Co., Wichita, at 1 Walker, 9-16n-1e, 4½ miles northeast of Meridian, Logan County, Oklahoma. Hole is projected to Wilcox, expected around 5,300 ft.

Brown & Tomer Drilling Co., Tulsa, has the contract for a wildcat test which Cameron Oil Co. has projected in southeastern Lincoln County, near the Okfuskee County line, Oklahoma, in 13-12n-6e. The location is about a mile north of the one-well North Garden Grove pool.

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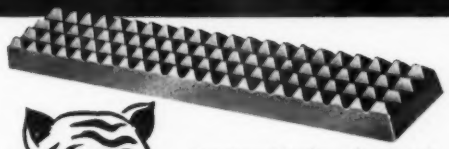

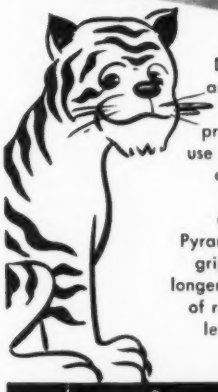

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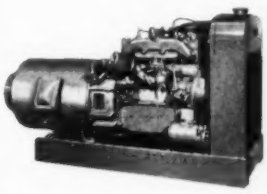

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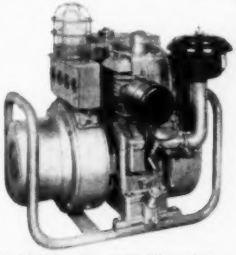

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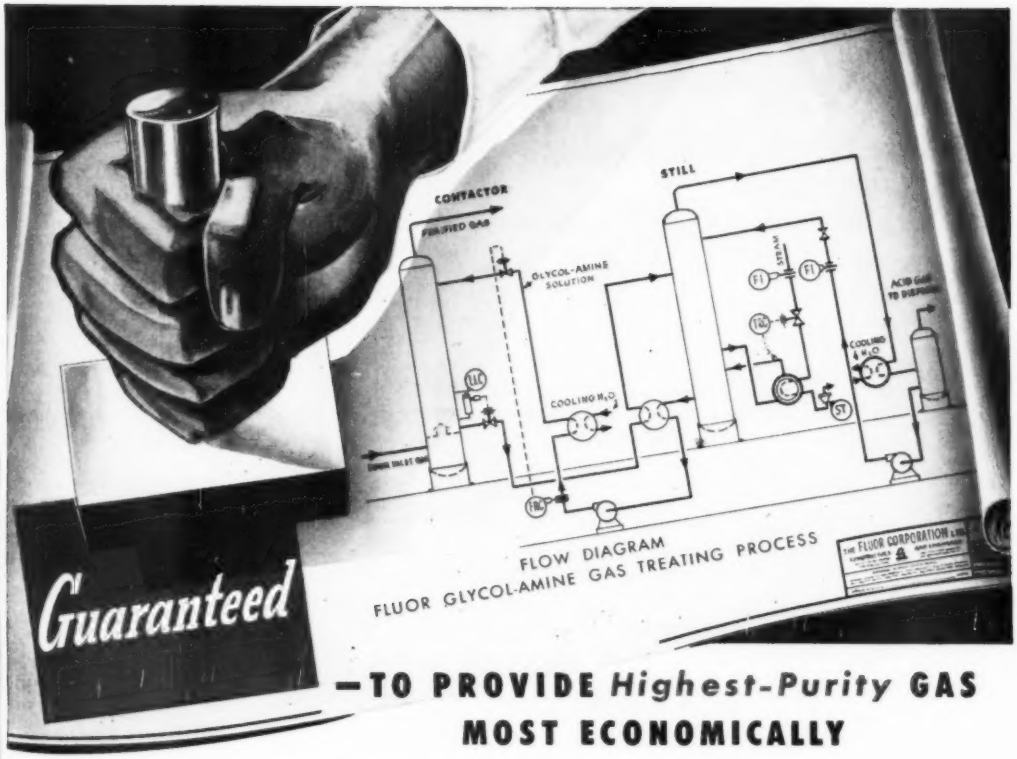

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REFINING

Sinclair Refinery Makes Turnaround in 309 Hours

A 309-hour turnaround after a 608-day run gave Sinclair Refining Co. a 97.8 per cent on-stream efficiency for the maiden run of a 28,000-bbl. fluid cat cracker at its East Chicago refinery.

Close cooperation between refinery and design engineers and all maintenance crafts made the quick turnaround possible. The operation was also speeded because personnel were forewarned of points needing the majority of attention because an identical plant at Marcus Hook, Pa., was turned around last spring. This turnaround achieved an on-stream efficiency of 96.2 per cent.

A total of 37,213 man hours of 18 different crafts went into the turnaround, an average of over 113 craftsmen on the job around the clock. Labor distribution is shown in the accompanying table.

Craftsmen—	Man hours	Per cent of total
Pipefitters	12,265	33.0
Boilermakers	4,380	11.8
Machinists	3,000	8.0
Welders	2,892	7.8
Labor	1,992	5.3
Burners	1,912	5.1
Riggers	1,905	5.1
Plug gang	1,696	4.6
Carpenters	1,156	3.1
Electricians	1,113	3.0
Instrument men	1,047	2.8
Insulators	996	2.7
Trucks, hyster, cranes and grader	900	2.4
Painters	655	1.8
Masons	652	1.8
Gas testers	345	0.9
Tinners	183	0.5
Blacksmith	124	0.3
Total	37,213	100.0

Sinclair's operating engineers feel that the time of the next turnaround can be reduced considerably by study of the time distribution for this job. Also, during the second run, operation is expected to be more settled since the unit will use a feed of consistent composition. During the 11,954,628-bbl. initial run feed-stock composition varied widely.

California Refining Co.'s Plant Being Revamped

Construction is under way to modernize the refinery of California Refining Co.'s plant at Barber, N. J. This plant is rated at 25,000 bbl. per day. Facilities being installed by C. F. Braun, M. W. Kellog, and others, include a crude unit, catalytic cracking unit, reformer, alkylation plant, and other equipment.

Completion is scheduled for the end of 1950, according to F. W. Mayer, vice president and treasurer of California Refining.

Mines Bureau Issues Report On Asphalt Yield in Oils

The U. S. Bureau of Mines' Petroleum Oil-Shale Experiment Station at Laramie, Wyo., has issued a report on the asphalts produced from Rocky Mountain "black oils" in cooperation with the University of Wyoming.

For commercial use asphalts produced from black oils compare favorably with those obtained from other crude oils widely used by the asphalt industry, the report discloses.

Studies of 117 asphalts from 25 crude oils of Wyoming, Montana, Arkansas, California, and Mexico are covered in the report. The information points out the suitability of Wyoming asphalts for commercial applications, but their suitability for specific uses was not determined by service and performance tests.

The paper, entitled "Asphalts from Rocky Mountain Crude Oils, Laboratory Preparation, and Comparison," No. 717, is available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C., for 25 cents. It is not for sale by the Bureau of Mines, the bureau emphasized.

Braun Awarded Contract for Socony Modification Work

C. F. Braun & Co. has been awarded contract for construction of a modified thermofor catalytic cracking unit at Socony-Vacuum Oil Co.'s Trenton, Mich., refinery. Engineering work has begun and actual construction in the field may be expected to begin by late spring.

The Trenton project is the second of Socony-Vacuum's program for converting Houdry units at three refineries to the new moving-bed process developed by the company engineers at Socony-Vacuum Laboratories, Paulsboro. A 10,000-bbl. Houdry case unit will be converted at the 25,000-bbl. plant.

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Branch Offices: Denver, Dallas, New Orleans

tract for revamping the six and nine-case units at the affiliated company's 150,000-bbl. refinery was let to the Lummus Co. Engineering is well under way, and construction will begin in early spring.

Bids are now being received for the third project, conversion of the 10,000-bbl. Houdry unit at the Socony-Vacuum Augusta, Kans., refinery. All of the three new T.C.C. units are expected to be on stream by the end of 1950. They will total 60,000 bbl. daily in charge capacity.

Sinclair Converting Plant To Marketing Service

TULSA.—Buildings and some of the equipment formerly used in connection with refining operations at Sinclair Refining Co.'s plant near Sand Springs, Okla., are being converted to marketing service, according to announcement by Sinclair Oil Corp. President P. C. Spencer. Since abandonment of the 7,000 bbl. per day refinery early in 1949, operations of the property have been centered around the distribution of finished products.

Much of the processing equipment suitable for use in refinery operations at other Sinclair plants has been moved. Future plans for the property calls for improvement of buildings and a general cleanup of the site. Also a part of future plans is the installation of equipment for maintenance of various marketing facilities including trucks.

Costs of Chemical-Type Plants Given in Report

Cost factors and operating expenses involved in setting up chemical-type operations, such as plants for manufacturing synthetic liquid fuels, anhydrous ammonia, and products of a similar nature, are discussed in an investigations report released recently by Oscar L. Chapman, Secretary of the Interior. Operating-cost estimates, exclusive of capital investment costs, are given for three types of single and joint-process plants.

The report was designed by the U. S. Bureau of Mines as a guide for the use of engineers and offers a uniform method adaptable to many types of chemical plants for estimating operating expenses covering direct costs, indirect costs or burden, fixed costs, and other costs including contingencies and distribution expense.

The report is available free of charge. Entitled "Guide for Making Cost Estimates for Chemical-Type Operations," and identified as Report of Investigations No. 4,534, it may be obtained from the Bureau of Mines, Publications Distribution Section, 4800 Forbes Street, Pittsburgh.

Co-Ops Consider Revamp, Expansion at Wyoming Plant

Cooperative Refinery Association, Kansas City, Mo., is considering revamping and expansion of its refinery at Newcastle, Wyo., which would increase the plant's nominal capacity rating to 3,000 bbl. per day.

Louis Brown, chief refinery engineer, reported that the association has the project under consideration, but no other details were revealed.

New Cat Cracker at Skelly Refinery in Partial Use

Skelly Oil Co.'s new fluid catalytic cracking unit at El Dorado, Kans., is now in partial operation. E. K. Anderson, Tulsa, manager of Skelly refineries, reported that in approximately 2 weeks the unit will be on full charge.

Construction work on the company's $10,000,000 improvement and expansion project at the El Dorado refinery was started in February, and building of a new crude unit is under way.

The entire improvement program will not be completed until April 1950.

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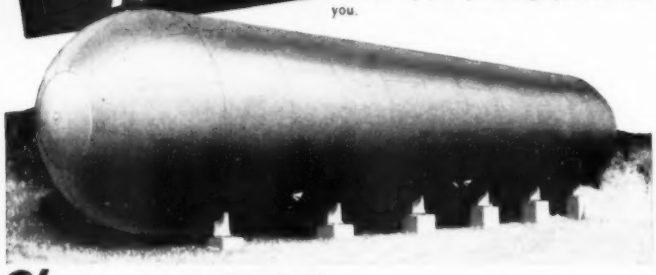

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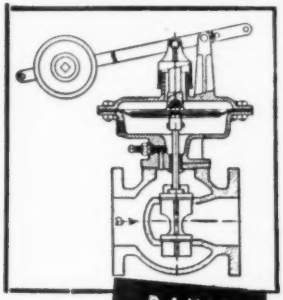

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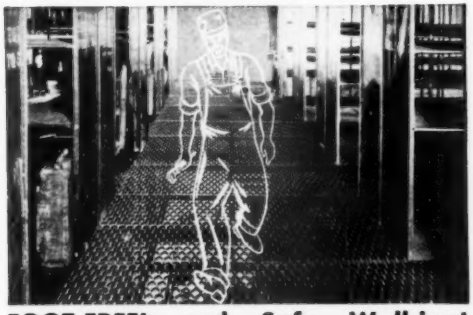

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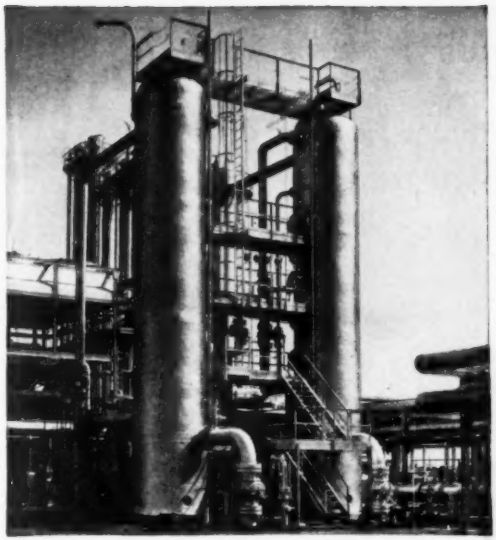

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Exploration and Drilling

Scurry Play Jumps North Into Kent County

THE Scurry County reef play, already the biggest United States oil strike in many years, may be about to take a 12-mile jump northeast, and across the line into Kent County. The well that will tell the first part of the story is the J. A. Chapman Producing Co. 1 D. M. Cogdell, in Section 716, Block 79, H&TC RR Survey about 12 miles northeast of North Snyder field, and about a mile north of the south line of Kent County.

From an elevation of 2,431 ft., the Cogdell well topped the Canyon reef at 6,773 ft., according to one call, or at 6,796 ft., according to another call. These calls place the datum on reef top at —4,342 ft., for the higher position, or —4,365 ft., for the lower. Assuming the water level to be the same as the North Snyder portion of the field, or —4,500 to —4,510 ft., there should be a good chance for a possible 150 ft. of potential oil column.

At the time this is being written, no data on a good drill-stem test were available. There were reports of good fluorescence and shows of gas in cores below the reef top. An attempted drill-stem test at 6,797-6,819 ft., open 1 hour, failed when the tool became plugged and the drill pipe leaked. When pipe was pulled, there was a recovery of 1,000 ft. of heavily gas-cut mud. An unconfirmed report said that a second test was started about the same interval, and had gas to the surface in a few minutes, but it was then decided to discontinue the test on account of darkness and wait for day light.

The over-all reef play, the main Canyon reef plus the lower reef (Strawn ?), now embraces portions of three other counties besides Scurry. These are the northwest corner of Mitchell County (south of Scurry), southwest portion of Borden County (west of Scurry), and now Kent County. *(For previous discussions of this area, see The Oil and Gas Journal, March 10, 1949, page 135; April 7, 1949, page 123; May 19, 1949, page 383, September 29, 1949, page 117; November 10, 1949, page 397; and December 8, 1949, page 113.)*

With proven reserves, by the most conservative methods of estimating, of some 800 million barrels, or a more liberal but reasonable estimate of potentially proven reserve of more than a billion barrels, Scurry County and the reef play today dominate the thinking and speculation of the exploration departments of practically every major company, and of hundreds of independents.

The logs and all scraps of information available on every well that went into the Pennsylvanian on the Eastern Platform, and far into the Midland Black Shale basin are being examined, not by one or two geologists, but by scores, perhaps hundreds, for evidence of reefing and reef trends. The new Kent County strike will distract but not divert the attention being given to ideas about a more easterly northeast extension from the North Snyder end of the field. Acreage has been acquired, and changed hands at high prices in the northeast end of Scurry County, and in and around the three-county corner area of Scurry, Fisher, and Kent counties. Two or more wildcats are expected to be started in that general three-county corner area in near future. There may be others. There is even some interest in an area in Garza County, west of the Kent County line, but far northwest of the Cogdell test. At least there is a lot of interest in the log and various reports on an old test drilled and plugged in 1939 in Section 25, Block 2, H&GN Survey, Garza County.

In circulating among exploration scientists, it is obvious that there has seldom been such a marshaling of specialists for a combined mass attack on a single problem: how to detect and predict reef trends.

One result is already evident. Smart geophysicists are taking a keen interest in what is now generally labeled "sedimentology;" while smart geologists are talking about "velocities," "time intervals," and other geophysical technical terms. One geophysicist said: "Five years ago I would have said anyone was crazy who told me that someday I would be boning up on sedimentology, or that 'X,' our research geologist, would be examining seismic records as eagerly as I was. But finding a billion barrels of oil in reefs in West Texas and easily another billion in reefs in Canada has done something to all of us. You just don't laugh off a billion barrels of oil because of some pet prejudice."

Charles J. Deegan

HIGHLIGHTS OF WEEK'S DEVELOPMENTS

WEST TEXAS.—One mile north and slightly west of the Tex Harvey field discovery, eastern Midland County, Harry Lake 1 Hugh Dixon, SE NE 9-37-T&P, had prospects of a new pay section, or discovery. A drill-stem test in the upper Sprayberry sand at 7,062-7,201 ft. recovered 2,370 ft. of clean oil. A second test from 7,201-7,317 ft. recovered 900 ft. of drilling fluid and 5,200 ft. of clean oil, with no formation water. Pipe was set to 7,062 ft., rotary moved off, and a portable unit moved in to shoot in open hole from 7,062-7,317 ft.

WEST CENTRAL TEXAS.—William Hamm 1 McNay, Strawn discovery in Runnels County, completed for 146 bbl. of oil a day. The new well is said to be separated from Fort Chadbourne field by a syncline, and operators believed it to be on a separate structure from Wingate field.

ROCKY MOUNTAIN AREA.—Oil-cut mud was recovered on tests in the Dakota at Hollingsworth-Newell 1 Neeland, wildcat in Dawes County, Nebraska, 75 miles north of the only other producing field in the western part of the state. Water was recovered on tests of the basal Sundance at the second well in the Lightning Creek area, Wyoming, by Atlantic Refining Co. Sun Oil Co. has abandoned its Brush Creek, Utah, wildcat after finding water in the Weber.

MISSISSIPPI

Southern Alabama To Get New Play

JACKSON. — Two major oil companies have taken out permits to drill wells in the deep salt basin of southern Alabama. State officials said this presaged the start of a fairly heavy drilling program for the area during 1950. Gulf Refining Co. is starting a well in northeastern Baldwin County, near Lottie. It will be the 1 W. M. Carney Mill Co. et al, 16-2n-4e. Humble Oil & Refining Co. has applied for permit to drill in the Alabama River swamp country of southern Clarke County, near Carlton.

Excellent recoveries have been cored in Carter Oil Co.s 1 J. L. Wilson, Smackover wildcat test in the Pickens area, Yazoo County, Mississippi. Schlumberger was run at 11,252 ft. and at 9,364-11,154 ft. 30 sidewall cores were attempted with recoveries in only 9, which were sand with no shows of oil or gas. However, cores between 10,418-11,186 ft. recovered hard, tight, fine grained sands with asphaltic stains. Coring will continue to present total depth of 11,418 ft.

Nine miles south of Natchez, in Adams County, Humble Oil & Refining Co. is running casing to total depth of 11,173 ft. in its 1 Mrs. Roane F. Byrnes. This wildcat has been the subject of much speculation as to whether or not it is a new discovery. The first zone in the lower Tuscaloosa, at 10,948-74 ft., was porous and permeable salt water sand. Sand with show of oil was present at 11,003-32 ft. Shale was found at 11,032-49 ft. and salt water sand at 11,049-62 ft. The lower Cretaceous was topped at 11,062 ft. It is very unusual in the lower Tuscaloosa to have a sand stringer with good show of oil below another stringer that carried definite salt water.

MISSISSIPPI WILDCAT FAILURES

Jefferson Davis County: Cities Service Oil Co. 1 Board of Supervisors, 16-6n16w, dry, TD 9,726 ft.

Wilkinson County: J. D. Reese 1 N. H. Breaux et al, 31-4n-3w, dry, TD 7,028 ft.

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KANSAS

New Arbuckle Lime Pool Indicated in Barton County

ANOTHER new pool is indicated in north Barton County where Franco Central Oil Co. and Pickrell Drilling Co. recovered 15 ft. of clean oil in a drill-stem test of Arbuckle lime in their 1 Klug, NE NE SW 8-17-12. Arbuckle was topped at 3,377 ft (—1,472 ft.), where casing has been run with bottom of the rotary hole at 3,379 ft. The location is 3½ miles south of Beaver, with nearest production being in the South Ainsworth pool, 2½ miles northwest, and the Laudick pool, about the same distance north.

Derby Oil Co. and associates 1 Balthazor, NW NW SE 13-9-21, ¾ mile east of the Morel pool, in eastern Graham County, recovered 360 ft. of free oil in a 15-minute drill-stem test at 3,728-33 ft. in Arbuckle lime, topped at 3,729 ft. (—1,528 ft.). Casing has been run to 3,730 ft., and standard tools are being moved in to complete. Showings also were encountered in the Lansing, topped at 3,428 ft., and, in which, a drill-stem test at 3,512-70 ft., gave a recovery of 30 ft. of heavily oil-cut mud with 180 ft. of oil-cut salt water and 240 ft. of salt water.

The new Davis Ranch pool in Wabaunsee County, in the northeastern part of the state, is being extended a half mile to the east at Aladdin Petroleum Corp. 1 Schutter, SW SW SW 34-13-10e, where 1,100 ft. of clean oil was recovered in a 15-minute drill-stem test of the pool's Viola lime pay zone at 3,306-14 ft. This well is reported to have run 148 ft. lower than the nearest well in the pool.

KANSAS SUCCESSFUL WILDCATS

Barton County: Aladdin Petroleum Co. and Crowe Drilling Co. 1 Schartz, SE SE NW 14-19s-12w, IP 98 bbl., Lansing 3,165-74 ft., TD 3,455 ft.

Ellis County: Texas Co. 1 Karlin, SW SW SE 9-13s-17w, IP 144 bbl., Arbuckle, 3,585-603 ft., TD 3,603 ft.

Marion County: Slusser Drilling Co. and Dwight Wilson 1 Rosie Holub, SE SW SW 5-19s-4e, IP 45 bbl., Mississippian, 2,360-66 ft., TD 2,366 ft.

Morris County: Loomis & Medmin 1 Atkinson, SW SW NE 15-17s-5e, IP 30 bbl., Mississippian, 2,232-77 ft., TD 2,277 ft.

KANSAS WILDCAT FAILURES

Barton County: Keyes Drilling Co. 1 Kimpler, SE SE NE 31-18s-11w, dry, TD 3,439 ft.

Ellis County: Duley Oil Co. 1 Schutts, NW SE NW 2-13s-18w, dry, TD 3,692 ft.

Graham County: Petroleum Incorporated Co. 1 White, SW SW SW 25-10s-21w, dry, TD 3,795 ft.

Harvey County: C. F. Myer, Trustee, 1 E. N. Hess, SW SW NW 17-22s-2e, dry, TD 3,545 ft.

Lyon County: Mendenhall Drilling Co. et al 1 Davis, SE SE SE 4-19s-12e, dry, TD 2,056 ft.

McPherson County: Mallard Drilling Co. and Westgate-Greenland 3 McCulle, NE NE SW 32-17s-1w, dry, TD 2,708 ft.

Morris County: Mouser Drilling Co. 1 Carlson Estate, SW SW NE 26-17s-5e, dry, TD 2,420 ft.

Mouser Drilling Co. 1 Peterson, SW SW NE 27-17s-5e, dry, TD 2,406 ft.

Rice County: Heathman Drilling Co. and

Mallard Drilling Co. 1 Fail, SW SW NE 21-18s-7w, dry, TD 3,448 ft.
Rooks County: V. D. Sidey 1 Matheson, NW NW NE 13-10s-16w, dry, TD 3,450 ft.
Wabaumsee County: Carter Oil Co. 1 Meseke, SE SE NE 29-12s-9e, dry, 2,421 ft. C. W. Chapman et al 1 L. B. Schwartig, SW SW NW 19-13s-12e, dry, TD 3,410 ft.
Woodson County: L. A. Weide 1 McMillen, SE SE NE 33-24s-14e, dry, TD 1,734 ft. Bethorne 1 Gordon, NE NW SE 13-24s-15e, dry, TD 1,508 ft.
Lincoln Oil Co. 1 Langdon, SW NW SW 16-25s-14e, dry, TD 1,575 ft.

N. CENTRAL TEXAS

Warren Test Looms as a Gas-Distillate Discovery

WICHITA FALLS.—Warren Oil Corp. 2 Gresham-Davis, John Little Survey, 6 miles northwest of Jacksboro in Jack County, was reported as a prospective gas-distillate discovery, based on drill samples and a drill-stem test in a conglomerate section.

Sandy lime and chert showing oil was logged from 4,983-92 ft., and chert from 4,992-96 ft. Cherty lime and conglomerate with light oil shows was drilled from 4,996-5,016 ft. A drill-stem test covering the first shows had gas in 1 minute, estimated at 1,000,000 cu. ft. daily, and recovered about ½ bbl. of distillate. Bottom-hole pressure was 2,550 psi. in 20 minutes, and flowing pressure was 825 psi.

A second test, open 2 hours, from 4,996-5,016 ft., had gas in 29 minutes, volume not estimated, and recovered about ½ bbl. of gas-cut mud. Operators were drilling ahead below 5,050 ft., to the Ellenburger.

Eight miles south of Jacksboro, L. F. Cox and Woods Drilling Co. 1 Dorcas Hensley, W. W. Price Survey, A-1708, topped the Ellenburger at 5,950 ft. Elevation was not reported. Drill samples had a slight oil show from 5,963-6,010 ft., but a 1-hour drill-stem test of the section recovered 15 ft. of drilling mud. A 75-minute test at 6,010-65 ft. recovered 2½ bbl. of salty mud and 6 bbl. of clear water, and at last report the well was to be abandoned. Total depth was 6,066 ft.

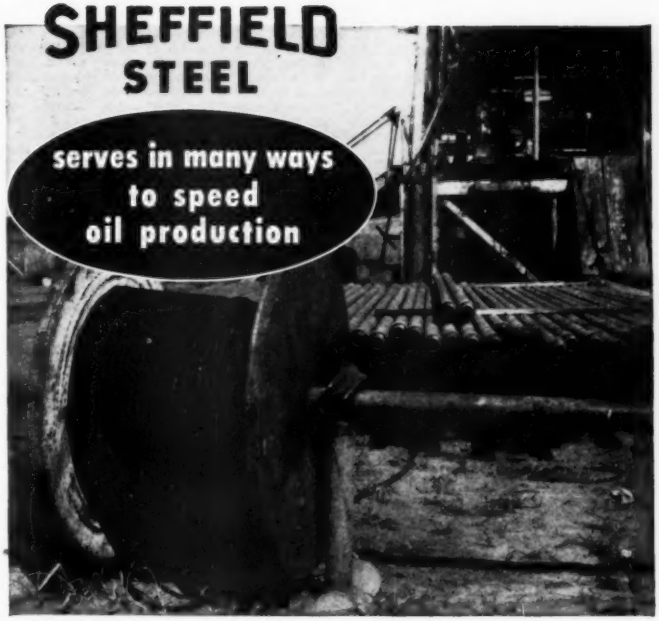
In Throckmorton County, Street Investment Co., Graham, Tex., staked location for a wildcat test 2½ miles southwest of Throckmorton and about 4 miles west of present production. The proposed 4,600-ft. rotary test is to be the 1-A N. R. Wright and J. F. Daws, 1,980 ft. from west line, and on the north line of Section 256.

William Hamm 1 Bessie Rhodes, Section 302, BBB&C Survey, about 2 miles south of production, made 201 bbl. of oil in 24 hours through 16/64-in. choke on completion test. Pay was from the Mississippian from 4,782-98 ft., total depth. Flowing tubing pressure was 760 psi., and casing pressure was 860 psi. No further tests were reported on oil shows in the Caddo lime at 4,336-66 ft.

Five miles southwest of Weatherford, Rowan Oil Co. and Texas Gulf Producing Co. 2 T. B. Saunders, Block A, I&GN Survey 3, A-1790, reported top of the Bend lime at 4,200 ft., and top of the Marble Falls at 4,465 ft. A drill-stem test from 4,473-95 ft., opens 90 minutes, showed gas in 35 minutes and recovered 100 ft. of gas-cut mud. A second test from 4,608-26 ft., open 2½ hours, recovered some 1,150 ft. of salt water, slightly gas cut. It was waiting on orders at 4,626 ft., total depth.

NORTH CENTRAL TEXAS (DISTRICTS 9 AND 7-B) WILDCAT FAILURES

Archer County: Bridwell Oil Co. 1 W. T. Hutcheson-Bridwell, Blk. 23, ATNCL Sur., 3 mi. N Archer City, dry, TD 5,453 ft., elev. 1,013 ft., Caddo 5,074 ft., Barnett shale 5,355 ft.
Cooke County: Kay Kimbell 1 R. A. Ritchie,



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A. Horton Sur., A-443, 5 mi. W Dexter, dry, TD 5,677 ft., elev. 640 ft.

Kimbell & Sims 1 Tom Blankenship, Blk. 26, Fannin CSL, A-1248, 1 mi. N Callisburg, dry, TD 6,365 ft., elev. 854 ft.

Jack County: L. F. Cox and Woods Drilling Co. 1 Dorcas Hensley, W. W. Price Sur., A-1708, 8 mi. S Jacksboro, dry, TD 6,066 ft., conglomerate 5,285 ft., Ellenburger 5,950 ft.

Shackelford County: Dillard & Waltermire 1 G. R. Davis, Sec. 27, Blk. 13, T&P, 12 mi. SE Leuders, dry, TD 1,643 ft., elev. 1,736 ft., lime 1,640 ft.

Taylor County: A. G. Hill 1 G. W. Teaff, Sec. 130, W. D. Hardin Sur., 5 mi. SW Tye, dry, TD 3,553 ft., elev. 1,895 ft., Valera 698-870 ft., Dotham 1,545 ft., Noodle 1,110 ft., coal 1,900-04 ft.

Van-Grisso Oil Co. 1 Tipton, 4-18-T&P, 2 mi. SW Merkel, dry, TD 3,105 ft., elev. 1,904 ft., Dotham 2,273 ft., Gun Sight 2,901 ft., reef 3,002 ft.

PERMIAN BASIN

Second Drill-Stem Test on Kent County Well Promising

MIDLAND.—J. A. Chapman Producing Co. 1 D. M. Cogdell, Canyon reef wildcat 8 miles north northeast of the North Snyder field, in southern Kent County, had better prospects of production on the basis of its second drill-stem test.

On elevation of 2,431 ft., it had top of the Wolfcamp at 4,328 ft., and top of the reef at 6,773 ft., or minus 4,342 ft., which operators estimated to be 250 ft. above water. Cores in top of the reef showed good fluorescence and shows of gas.

First test was in a sand above the reef, topped at 6,464 ft., and tested from 6,443-75 ft., for an unspecified time. Recovery was 250 ft. of drilling mud. Hydrostatic pressure was 3,200 psi. Operators reported leaky drill pipe during the test.

A 1-hour test in the reef from 6,797-6,819 ft. was not considered successful due to the tool plugging, but recovery was 1,000 ft. of heavily gas-cut mud. It was to make another test. Total depth was 6,819 ft.

Scurry County.—Lion Oil Co. 23 C. T. McLaughlin, NE SE 201-97 H&TC, first test carried to the water level in the Diamond M field, found the water around 4,500 ft., which would compare with the water in the North Snyder area. Previously, according to some observers, it was assumed the water table was around 4,430 ft., based on wells in the Sharon Ridge Canyon field. Drill-stem tests and recoveries were:

From 6,897-7,907 ft., open 9 hours and 40 minutes, gas in 8 minutes, headed oil for 2 hours, and recovered 1,840 ft. of light, high-gravity oil plus 276 ft. of salt water; from 6,927-37 ft. recovery was 180 ft. of oil, 180 ft. of salt water and 30 ft. of oil-cut mud; from 6,937-57 ft., gas showed in 5 minutes and in 4 hours recovery was 214 ft. of salt water and 276 ft. of oil; a 2-hour test from 6,957-77 ft. had gas in 10 minutes which died in 30 minutes, and recovered 250 ft. of salt water with no oil. Flowing pressure on the last two tests was zero; shut-in pressure after the last test was 2,750 psi. in 20 minutes. Operators prepared to test from 6,973-83 ft. The 23 McLaughlin, on elevation of 2,404 ft., had top of the reef at minus 4,293 ft.

In eastern Scurry County, M. E. Davis and J. Conley Miles 1-A J. J. Schattel, 90-2-H&TC, logged a good show of oil in the Ellenburger, on which top was placed at 7,750 ft., on an elevation of 2,459 ft. A 1-hour drill-stem test from 7,750-71 ft., using $\frac{5}{8}$ and 1-in. chokes, showed gas in 18 minutes and recovered 600 ft. of clean oil, with no water, plus 15 ft. of mud. Gravity of the oil was said to be around 40°. At last report it was slated to core to 7,781 ft. and run another drill-stem test. Location is some 8 miles northwest of R. W. Baxter 1 Feldman, small Ellenburger discovery in the process of completion.

One mile east of Kelley field production, George P. Livermore, Inc., 1 H. Winston, Tract 69, Section 11, J. P. Smith Survey, drilled plug from $5\frac{1}{2}$-in. casing set at 7,473 ft., acidized with 1,000 gal. of regular acid, and kicked off to flow after pulling the swab 4 trips. The well made 33.3 bbl. of oil the first hour, then was estimated to be flowing at the rate of 700 bbl. of oil a day, with no water. Pressures and choke size were not reported. Top of the Strawn pay was placed at 7,476 ft.

Tom Green County.—C. L. Norsworthy, Jr., 1 W. C. Jones, 38-24-H&TC, swabbed salt water after perforating casing at 5,406-20 ft., in the reef lime, and with packer at 5,390 ft. Previously it tested all salt water from perforations at 5,522-42 ft. Total depth was 6,005 ft., in the Ellenburger, drilled out to 5,717 ft.

Sun Oil Co. 2 M. P. Pulliam, Strawn prospect 4 miles west of San Angelo, 14-4-H&TC, swabbed wash water and acid water with a show of oil after treating with 500 gal. Total depth was 5,552 ft., with $5\frac{1}{2}$-in. casing set at 5,520 ft. The well had previously made good shows of oil on drill-stem tests, but had little oil since drilling the plug.

WEST TEXAS (DISTRICTS 8 AND 7-C) SUCCESSFUL WILDCATS

Runnels County: William Hamm, Jr., 1 S. L. McNay, Jose Marea Garcia Sur. 299, $3\frac{1}{2}$ mi. NW Wingate, TD 5,330 ft., elev. 1,990 ft., top Strawn 5,320 ft., flowed 146 bbl. of 45°-gravity oil a day, 12/64-in. choke, GOR 1,286 cu. ft., TP 225 psi., CP 525 psi.

Rambo & Stephens and T. W. Murray 1 William Stephens, Sec. 81, CTRR Sur., 6 mi. NW Winters, $1\frac{1}{2}$ mi. W North Winters field, TD 4,520 ft., elev. 2,009 ft., top Strawn pay 4,500 ft., flowed 1,652 bbl. of 47°-gravity oil a day, $\frac{3}{4}$-in. choke, GOR 681 cu. ft., TP 310 psi., CP 240 psi.

Scurry County: Placid Oil Co. 1 R. H. Odom, NW NW 388-97-H&TC, two locations E 1 Davis, TD 7,735 ft., elev. 2,328 ft., Ellenburger 7,713 ft., pumped 5 bbl. of 36°-gravity oil, Canyon lime 7,030 ft.

WEST TEXAS (DISTRICTS 8 AND 7-C) WILDCAT FAILURES

Concho County: Lamb and Ford Drilling Co. 1 J. T. Rice, Sec. 18, R. W. Hoskins Sur., 4 mi. E and 2 mi. N Pasche, dry, TD 2,000 ft.

Crockett County: Ted Weiner and J. H. Snowden 1-E Isabel Bean Vaughn, SW NW 88-OP-GC&SF, $1\frac{1}{2}$ mi. S Vaughn field, dry, TD 8,855 ft., elev. 2,616 ft., San Andres 1,480 ft., Clear Fork 3,010 ft., Wolfcamp 6,340 ft., Ellenburger 7,996 ft.

Lynn County: H. E. Chiles and E. C. Lawson 1 G. C. McPherson, NW NW 14-O-H&OB, 12 mi. SE Mound Lake field, dry, TD 5,215 ft., elev. 3,137 ft., anhydrite 2,130 ft., Grayburg 4,180 ft., San Andres 4,365 ft.

Pecos County: Hunt Oil Co. 3 Elsinore Royalty Co., 20-C-GC&SF, 9 mi. SE Chancellor, dry, TD 1,715 ft., elev. 3,763 ft.

A. G. Slocum 1 J. G. Crockett, 58-10-H&GN, 9 mi. SW Buena Vista, dry, TD 1,458 ft., elev. 2,504 ft.

Runnels County: Robinson & Puckett 1 T. E. Chapmond, Sec. 53, HT&B Sur., $4\frac{1}{2}$ mi. SW Winters, dry, TD 4,914 ft., elev. 1,828 ft., reef 3,350 ft., Caddo 4,676 ft., Ellenburger 4,782 ft.

Tom Green County: H. G. Spiller 1 John E. Melde, Peter Kessler Sur., 1642, 20 mi. E San Angelo, dry, TD 4,704 ft., elev. 1,795 ft., Canyon 3,154 ft., Strawn 4,065 ft., Ellenburger detrital 4,580 ft., Ellenburger 4,607 ft.

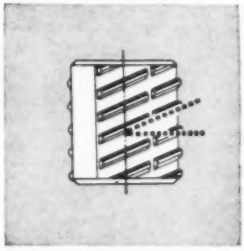
SOUTHEASTERN NEW MEXICO

HOBBS.—Honolulu Oil Corp. 1 State, 13-11s-27e, Chaves County wildcat, was drilling below 3,820 ft. in lime following two drill-stem tests which had no shows. From 3,000-3,114 ft., open 2 hours, the recovery was 15 ft. of drilling mud, and from 3,119-89 ft., the recovery was 25 ft. of drilling mud, in the same time.

In Lea County, Magnolia Petroleum Co.

SECURITY CASING SCRAPER MAY BE RUN THREE WAYS

Casing is scraped clean when the Security Casing Scraper is run on either (1) wire line, (2) tubing, or (3) drill pipe. This is possible because it is the only scraper whose cutter teeth contact 360° of the casing circumference at all times. Multiple teeth positively clean every inch of casing with rotary or vertical movement. For example, on the 7" Security Casing Scraper, there are 24 individual shearing teeth which form a total of 98 linear inches of cutting surface. The teeth act upon an obstruction approximately 800 times under average operating conditions.



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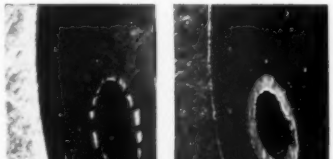
The helical teeth on the four opposed, spring loaded cutters produce shearing action which cleans casing quickly, cutting away all burrs or foreign material. Reversible cutters give extra service life.



Perforation Burrs Removed Cleanly

Unretouched photograph of gun perforation before and after removing burrs with Security Casing Scraper. Photo on right shows burr is actually cut (sheared) away, not crushed or broken. For economical scraping, specify Security.

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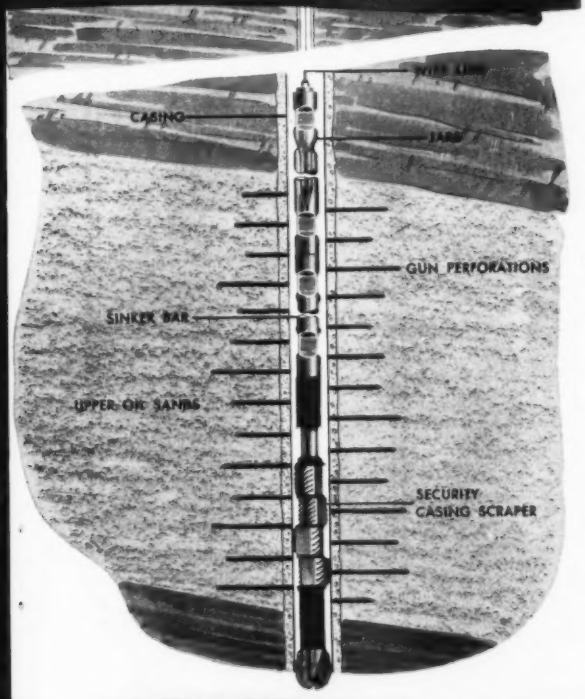
LOCATION: Signal Hill

WELL HISTORY: Depleted production required recompletion at upper pay zone. Gun perforated at 10,000 feet opposite new pay.

PROBLEM: Economically scrape casing perforations without rotary equipment.

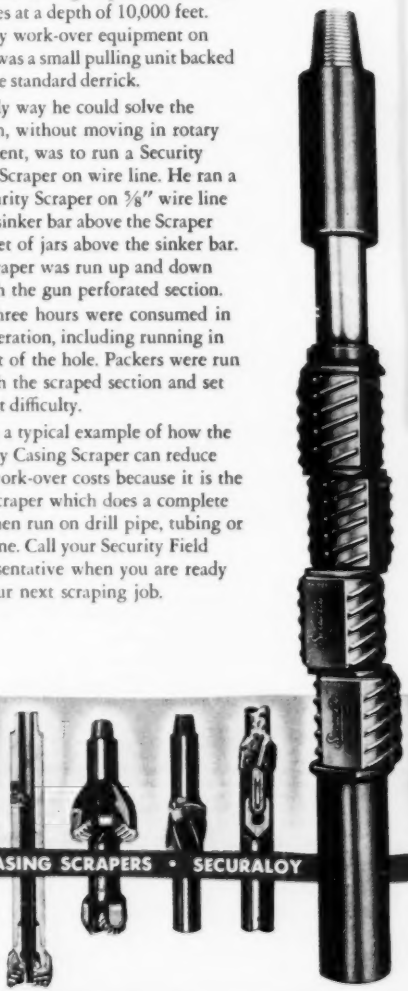
How would you Scrape Casing Without a Rotary?



The production superintendent of a large oil company was faced with the problem of scraping 7" casing which had been gun perforated with 150 holes at a depth of 10,000 feet. The only work-over equipment on the job was a small pulling unit backed up to the standard derrick.

The only way he could solve the problem, without moving in rotary equipment, was to run a Security Casing Scraper on wire line. He ran a 7" Security Scraper on 5/8" wire line with a sinker bar above the Scraper and a set of jars above the sinker bar. The scraper was run up and down through the gun perforated section. Only three hours were consumed in this operation, including running in and out of the hole. Packers were run through the scraped section and set without difficulty.

This is a typical example of how the Security Casing Scraper can reduce your work-over costs because it is the only Scraper which does a complete job when run on drill pipe, tubing or wire line. Call your Security Field Representative when you are ready for your next scraping job.



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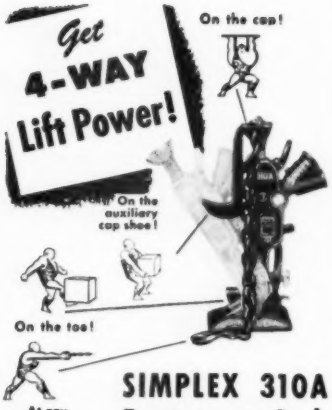

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1-B Tom Betenbaugh, NE NE 14-9s-35e, southwest extension try to Bough field, was drilling in lime below 8,910 ft. A core from 8,830-85 ft. recovered dolomite with some pin-point porosity and some bleeding oil. A 1½-hour drill-stem test from 8,824-91 ft. recovered the 810 ft. of water blanket plus 90 ft. of drilling mud with no shows. Flowing pressure was 500 psi. Two miles east of the field, Magnolia 1 Walker, 8-9s-36e, was drilling below 9,092 ft. in the Wolfcamp topped at 8,999 ft. A core from 8,900-59 ft. recovered 59 ft. of dolomite with white anhydrite and black shale, with scattered porosity. From 8,960-9,018 ft. the recovery was 38 ft. of dolomite with anhydrite stringers and pin-point porosity from 8,974-78 ft., and 20 ft. of lime.

Amerada Petroleum Corp. 1-BTD State, SE SW 2-12s-33e, southwest extender to Bagley field, completed for an initial flowing potential of 929 bbl. of 46 -gravity oil a day, through ½-in. choke. Total depth was 10,995 ft., elevation was 4,250 ft., and top of Devonian pay was 10,820 ft. Casing was set to 10,980 ft.

Gulf Oil Corp. 1 Maud Saunders, 34-14s-33e, deep test 13 miles southeast of Caprock field, was reported drilling at 12,499 ft. in sand and lime.

SOUTHEAST NEW MEXICO WILDCAT FAILURES

Eddy County: Wills & Riggs 1 Calvin, 12-20s-36e, 10 mi. S Dayton, dry, TD 610 ft., elev. 3,311 ft. Queens 567 ft.

York & Harper, Inc., 2 State, NW NW 36-24s-27e, 6 mi. SW Malaga, dry, TD 2,520 ft., elev. 3,157 ft., salt 1,615 ft., black lime 2,383 ft., Delaware sand 2,430 ft.

Lea County: Magnolia Petroleum Co. 1 Laura May, NW NE 35-22s-37e, ½ mi. E Penrose-Skelly field, dry, TD 8,834 ft., Yates 2,540 ft., San Andres 3,920 ft., Glorietta 5,140 ft., San Angelo 5,135 ft., Drinkard sand 6,357 ft., detrital 7,265 ft., Devonian 7,280 ft., Silurian 7,580 ft., Fusselman 7,650 ft., Montoya 7,790 ft., Simpson 8,120 ft., McKee 8,445 ft., pre-Cambrian 8,817 ft.

SOUTH LOUISIANA

Shell Oil Co. Gages Distillate Discovery

NEW ORLEANS—Shell Oil Co. has gaged its new discovery in the Castell area of Terrebonne Parish. The 1 Continental Land & Fur Co. flowed 65 bbl. of 47.5°-gravity distillate per day through a 12/64-in. choke, with 8,000 psi. flowing pressure on the tubing. The well was drilled to a total depth of 12,002 ft., and is producing through perforations at 11,980-88 ft. It is located in Section 32-17s-14e, approximately 4½ miles north-northwest of Bayou Penchant dome.

Drilling activity was recently revived in the Big Island area of Rapides Parish, when Union Producing and M. H. Marr completed the 1 Hudson, NW NE 11-4n-3e, for 390 bbl. of oil per day through 14/64-in. choke through perforations at 5,565-67 ft. in the Wilcox. It now appears that these operators will bring in two new wells: the 1 Morace unit, east offset, and the 1 Beaubouef, west offset. Drill-stem tests have been made on both ventures indicating good sands at several levels. Testing continues on the 1 Beaubouef, while operators are running casing in the 1 Morace unit.

Thirty-one sidewall cores around 10,500 ft. were taken in Sohio Petroleum and The Chicago Corp. 1 Am. Wurmnest et al, wildcat test approximately 1½ miles east of South Lake Charles production but no shows were encountered. Log was also run with no shows, and operators are now drilling toward contract depth of 11,500 ft.

SOUTH LOUISIANA SUCCESSFUL WILDCAT

Terrebonne Parish: Gas-condensate discovery—Shell Oil Co. 1 Continental Land & Fur Co., Inc., Castell area, 32-17s-14e, top pay 11,980 ft., TD 12,002 ft., perf. 11,980-88 ft., 65 bbl. of condensate per day.

SOUTH LOUISIANA WILDCAT FAILURE

Iberia Parish: Magnolia Petroleum B-1 State Lease 684, Eugene Islgand area, Block 94, offshore, dry, TD 9,212 ft.

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SOUTHWEST TEXAS

New Field Gets New Producer

CORPUS CHRISTI.—A new sand producer is being completed in the newly discovered Cement field of Nueces County. Henshaw Brothers and O. R. Mitchell drilled the 1 H. R. Bryant to a depth of 6,702 ft. and set 5½-in. casing at 6,702 ft. Casing was then perforated from 6,196-6,201 ft. and the well flowed an estimated 50-60 bbl. of oil through 7/32-in. choke with 100 psi. tubing pressure. It is now cleaning into pits. Location is 940 ft. northeast of Henshaw Brothers 1 Humble, pool opener, which was perforated at 6,620-28 ft. and flowed 36 bbl. of 39.5°-gravity oil on potential test.

A shallow oil sand was found from 414 to 423 ft. in the American Oil Co. 2 Cain, Cain and Smith lease (Robert Schallert fee), GH&H RR Co. Survey 81, Abstract 249. Production string has been set at 414 ft. and operator will test the sand.

The Texas Co. 1 Duval County Ranch Co. Unit 2, Duval County wildcat 7½ miles southwest of Freer, promises to open a new pool. Several drill-stem tests were made, the most promising of which was made at 2,334-43 ft. In 7½ minutes, recovery was 23 ft. of gas-cut mud cut with distillate through ⅜-in. bottom and ¼-in. top chokes.

O. W. Killam 75 Bruni estate, Webb County wildcat 1 mile south of Bruni, was completed for 2,000,000 cu. ft. of gas per day on open flow potential through perforations at 2,801-07 ft.

SOUTHWEST TEXAS (DISTRICTS 1 AND 4) SUCCESSFUL WILDCATS

Nueces County: Gas-condensate discovery—The Atlantic Refining Co. 1 State Tract 429, Corpus Christi Bay, 8 mi. SW Port Aransas, top pay 7,700 ft., TD 7,917 ft., perf. 7,700-30 ft., 36 bbl. of condensate, ¼-in. choke, TP 2,450 psi.

Gas discovery—The Atlantic Refining Co. 1 State Tract 430, approximately ½ mi. N State Tract 436, 8 mi. SW Port Aransas, top sand 6,818 ft., TD 7,893 ft., perf. 6,818-32 ft. and 6,858-68 ft., 1,730,000 cu. ft. of gas per day, 3/16-in. choke, TP 2,595 psi.

Starr County: New pay, Jay Simmons—C. G. McCaleb and W. Earl Rowe et al 1 Jose G. Garcia, Share 4, Subd. "C," Santa Cruz Grant, dual completion, top pay 6,447 ft., TD 6,455 ft., perf. 6,451-55 ft., 74 bbl. of 43.9°-gravity oil per day, 5/64-in. choke, GOR 1,150, TP 1,350 psi.; top pay 6,029 ft. (new sand), perf. 6,029-33 ft., 91 bbl. of 41.3°-gravity oil per day, 7/64-in. choke, GOR 615, CP 550 psi.

SOUTHWEST TEXAS (DISTRICTS 1 AND 4) WILDCAT FAILURES

Bastrop County: Gage & Kopel 1 Dave Smith, James B. Blalock Sur., 5 mi. SW Cedar Creek, dry, TD 2,250 ft.

Guadalupe County: J. A. Hafner 1 W. G. Zunker, Michael Ramel Sur., 1 mi. E New Berlin, dry, TD 1,850 ft.

Jim Hogg County: Morris Cannan 1 J. Gruy, Sec. 1, V. Kohler Subd., Noriacitas Grant, 1 mi. NE Hebbronville, dry, TD 4,324 ft.

Cecil Hagen 1 Anastacio Garza, Black 11, Sur. 40, 12 mi. SW Randado, dry, TD 2,530 ft.

Jim Wells County: Rand Morgan O-1 fee, Richard King Farm lots, J. Poitevent Sur., A-366, 1½ mi. E Alfred, dry, TD 5,705 ft.

Kenedy County: Sun Oil Co. 1 State Tract 228, Laguna Madre, 25 mi. E Sarita, dry, TD 11,128 ft.

Milam County: A. A. A. Production Co. 1 Minnie Fowler, Davilla Sur., 10 mi. NE Granger, 3 mi. W Davella, dry, TD 1,250 ft.

San Patricio County: Bridwell Oil Co. 1 E. C. McDaniel, Sec. 1, Geo. H. Paul Subd., Coleman Fulton Pasture Lands, 3½ mi. SE Sinton, dry, TD 8,006 ft.

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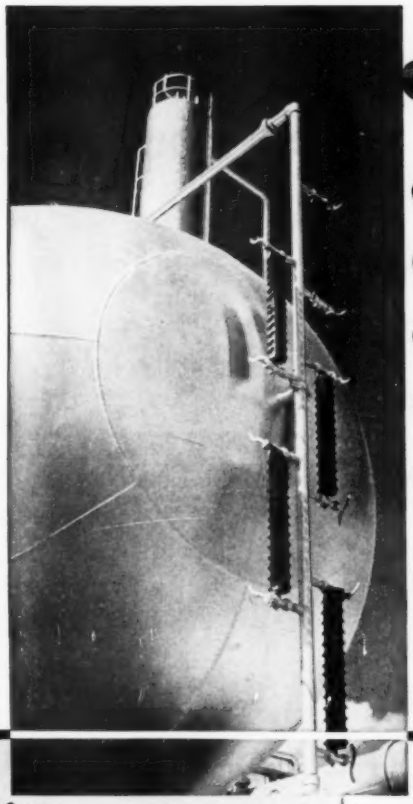

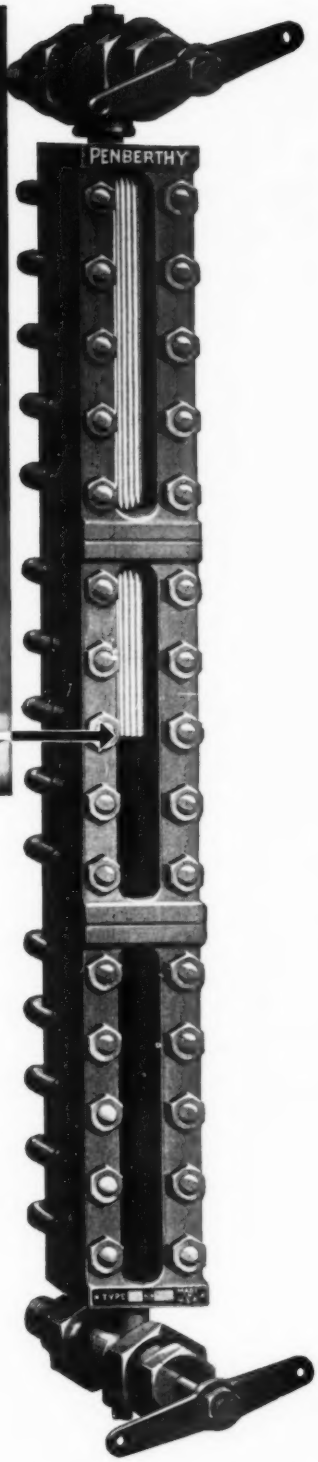

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Starr County: Continental Oil Co. 1 Nora Marks Villareal et al, Rincon area, Sur. 483, 1½ mi. W Rincon field, dry, TD 5,015 ft.

The Texas Co. 4 S. D. Bloomberg, Bloomberg area, Zavier Zamora Porcion 41, A-77, 11 mi. NE Grulla, dry, TD 4,302 ft.

Uvalde County: Robert Flannagan and William Perlman 1 H. C. Wilke, Hamilton Smith Sur. 221, 6 mi. S Campwood, dry, TD 2,004 ft.

Universal Petroleum Co. 1 M. E. Ranch, Sur. 645, M. P. Zoto League, 3½ mi. SE Utopia, dry, TD 2,345 ft.

Val Verde County: Orbison, Yoas, King & Parker 1 Mrs. Martha Harrison, GC&SF Sur. 31, 9 mi. NE Loma Alta, dry, TD 1,160 ft.

Webb County: O. W. Killam 1 J. E. Neal, Sur. 1,008, 1 mi. S SE Oilton, dry, TD 2,542 ft.

Williamson County: O. W. Killam 1 O. W. Smith, Harrison Owen Sur., 5 mi. NE Thrall, dry, TD 2,303 ft.

J. J. Moore Oil Co. 1 W. B. Farris, James Northcross Sur., 17 mi. NW Georgetown, dry, TD 441 ft.

Bill Reeves 1 G. G. Stern, Nathaniel Edwards Sur., 1 mi. N Hutto, dry, TD 1,150 ft.

ROCKY MOUNTAIN

Test Renews Interest In Far NW Nebraska

DENVER—Recovery of oil and gas-cut mud in the Hollingsworth-Newell rank wildcat in the northeastern part of the Denver Basin, 75 miles north of production in the Gurley area of western Nebraska, caused renewed interest in oil possibilities of tnis area. The well is the 1 Neeland, C NE SE 30-30n-48w, in the Cottonwood area, Dawes County, Nebraska. The drill-stem test was made of the first Dakota between 2,478-91 ft. A second sand was encountered between 2,515-30 ft., with oil shows in samoles of this zone, and the operator is now drilling for the basal Sundance with the well below 2,785 ft. On the test there was a blow in 12 minutes and the recovery was 660 ft. of light green paraffin-base oil. The area is midway between the towns of Alliance and Chadron, reportedly on a surface structure. Although various surface highs have been drilled throughout the Denver Basin, commercial production has resulted only along the western rim of the basin, north of Denver. Early this year The Ohio Oil Co. found Dakota sand production on a seismic high 10 miles northeast of Sidney, Cheyenne County, and now has five producing wells in that field (Gurley). The company is now drilling a wildcat 6 miles southwest of Gurley and oil was recovered on tests in the first Dakota in this well with sizable volumes of gas from the second and third Dakota sands. Ohio is now drilling below 4,915 ft. in this test planned to go to granite at around 8,000 ft. Leasing is still reported active in the Denver Basin area, including counties in northeastern Colorado, southwestern Nebraska, and in Cheyenne County, Kansas. In addition to Ohio, Superior Oil Co., The Texas Co., Union Oil Co. of California, British-American Oil Producing Co., and others have lease holdings in the area.

At the Lightning Creek second well, Niobrara County, Wyoming, Atlantic Refining Co. had disappointing results on tests in the basal Sundance. A drill-stem test at 3,834-69 ft. at the company's 1 Joss, C NW NW 1-34n-66w, recovered 1,475 ft. of black sulfur water with only a slight show of oil. Top of the first Sundance was found at 3,627 ft. and first basal Sundance at 3,770 ft. On a test at 3,760-96 ft., the well made 196 ft. of oil and gas-cut mud in 1 hour. The discovery well on this structure was completed early this year pumping approximately 200 bbl. of oil daily from the basal Sundance. Atlantic is drilling the well on a farmout from J. M. Huber Corp. and will

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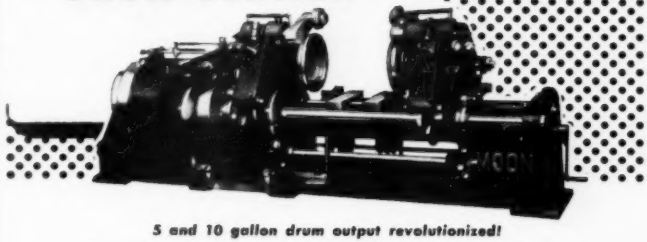

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probably test the Minnelusa (Pennsylvanian) in the well. The operator is now drilling below 4,092 ft. Location for the third well has been announced, 2 miles north of the present test and 1 mile north of the discovery.

Sun Oil Co. has plugged its 1 Neil-Government, NE SW SE 26-4s-22e, Brush Creek area, Uintah County, Utah, at 4,296 ft., total depth, after finding water in the Weber sand. The well topped the Weber at 4,273 ft., and the zone made water on drill-stem test. Slight shows of oil were encountered in the Phosphoria, but the zone was not commercial. The wildcat was located northeast of Ashley Valley Weber sand production.

Utah Southern Oil Co. is drilling below 1,950 ft. on an interesting wildcat in the Evanston area, Summit County, Utah. The well is the 1 Hatch, SW SE NW 38-6n-8e, and is carried as a tight hole.

WYOMING WILDCAT FAILURES

Crook County, Pine Ridge: Fred Moffatt 1 Dunbrille, C NW NW 20-49n-65w, TD 480 ft., dry, Newcastle 435 ft.

Sweetwater County, Canyon Creek: Stanolind Oil & Gas 1 Unit, C NE NW 3-12n-101w, TD 13,321 ft., dry, Lewis 4,100 ft., Mesa Verde 4,689 ft., Blaire 6,950 ft., Mancos 7,278 ft., Fontier 12,685 ft., Afton 12,844 ft., Dakota 13,108 ft., Morrison 13,250 ft.

Weston County, Black Thunder: Brinkerhoff Drilling 1 Govt., C SE SE 8-42n-66w, TD 7,384 ft., dry, Niobrara 5,710 ft., Frontier 6,028 ft., Newcastle 7,096 ft., Dakota 7,288 ft.

COLORADO SUCCESSFUL WILDCAT

Routt County: Oak Creek: R. E. Havenstrite 2 Ryles, NW SW NE 2-3n-86w, TD 7,747 ft., pumped 250-300 bbl. oil per day from Morrison topped at 6,305 ft., 7-in. casing at 6,644 ft.

COLORADO WILDCAT FAILURE

Montrose County, Paradox: W. D. Broadhead 1 Wilcox, SW SW SE 18-47n-18w, TD 1,002 ft., dry.

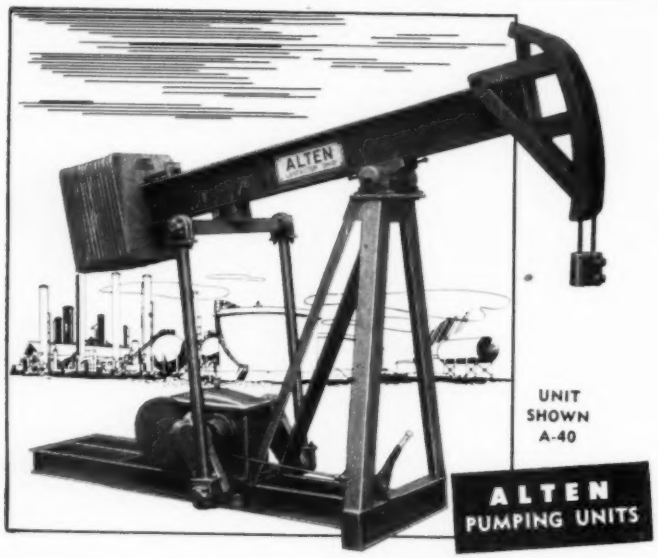
MONTANA SUCCESSFUL WILDCAT

Rosebud County, Sumatra area: The Texas Co. 1 NPRR "E," NE NE NE 5-9n-34e, TD 6,006 ft., PB 4,415 ft., pumped 55 bbl. oil in 24 hours, 7-in. casing in Amsden at 4,385 ft.; Judith River 460 ft., Claggett 100 ft., Eagle 1,230 ft., Colorado 1,405 ft., first Cat Creek 3,280 ft., Kootenai 3,382 ft., third Cat Creek 3,572 ft., Morrison 3,650 ft., Ellis 3,810 ft., Gypsum Springs 4,205 ft., Amsden 4,330 ft., Heath 4,650 ft., Otter 4,935 ft., Kibby 5,280 ft., Charles 5,505 ft., Madison 5,950 ft.

MONTANA WILDCAT FAILURES

Carter County, Whitetail Creek: Amerada Petroleum Corp. 1 Govt., C NW NW 15-5s-57e, TD 4,812 ft., dry, Greenhorn 1,440 ft., Newcastle 2,530 ft., Dakota 2,885 ft., Ellis 3,298 ft., Gypsum Springs 3,750 ft., Spearfish 3,890 ft., Minnekahta 4,325 ft., Opeche 4,356 ft., Minnelusa 4,496 ft.

Musselshell County, SE Howard Coulee: Texas-Amerada 1 Unit, C SE NW 2-10n-28e, TD 4,545 ft., first Cat Creek 2,450 ft., Kootenai 2,565 ft., second Cat Creek 2,675 ft., third Cat Creek 2,785 ft., Gypsum Springs 3,390 ft., Amsden 3,435 ft., Chugwater 3,465 ft., Heath 3,780 ft., Otter 3,970 ft., Kibby 4,395 ft., elev. 3,058 ft. gr.



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MICHIGAN

Potential Richfield Strike Seen in Ogemaw County

MOUNT PLEASANT.—United Drillers & Producers, Inc., 3 State-Rose, SE SW NE 4-24n-3e, Rose Township wildcat, Ogemaw County, was reported to be swabbing about 16 bbl. of oil every 4 hours, natural, from the Richfield at 4,270 ft., total depth, and offered excellent prospects of being a potentially important Richfield zone discovery. This wildcat was drilled on farm out acreage from Sohio Petroleum Co. and Ohio Oil Co. which was a part of the jointly owned Mio structure block.

The Mio area came in for important consideration in 1946 when one of the joint ventures was completed as a small (now abandoned) Detroit River-Richfield discovery at 4,180 ft. This well was located in Section 30-25n-2e, Mentor Township, Oscoda County, further to the north. At least one other deep zone test, completed as a failure, was drilled by Sohio-Ohio in the same play.

Another important Richfield zone wildcat was cased with 7-in. at 5,027 ft. where several oil show sections will be jet-perforated and tested. This well, Superior Oil Co. 1 Kenyon, NE NW SW 12-20n-1w, Butman Township, Gradwin County, located ½ mile north of the line Dundee producer and discovery well in the area, was reported to have logged seven or more distinct oil shows between 4,875-4,980 ft. The best of these shows was reported at 4,921-31 ft., described as being comparable with "Zone 4" producing horizon as drilled in Beaver Creek Richfield pool. The black lime, probably the base of the Richfield, was logged at 4,992 ft., and a bleeding salt water core was recovered from 5,009-18 ft. It was in this black lime that long string of casing was run and cemented with 500 sacks.

Mogul Oil Co. B-1 Domokos, 11-18n-1w, deeper horizon test for the Buckeye Dundee oil producting structure, Gladwin County, was being cored at 5,244 ft. A change in sedimentation was reported at 5,160 ft. which might be the Sylvania series contact point. No sand had been encountered in that zone up to this report.

MICHIGAN SUCCESSFUL WILDCATS

Allegan County, Watson Township: Ralph Perry and Ralph Bradley 1 Nykamp, NW NW NE 8-2n-12w, Traverse 1,775 ft., 3 bbl. of oil after acid, TD 1,781 ft.

Oceana County, Claybanks Township: New pay, Stony Lake field—Turner Petroleum Corp. 1 Rabe, SW NE NE 9-13n-18w, Berea 931 ft., 7 bbl. of oil natural, TD 942 ft.

MICHIGAN WILDCAT FAILURES

Allegan County, Casco Township: Pascal F. Broughton 1 Johnson, NW NE SE 15-1n-16w, Traverse 1,204 ft., dry, TD 1,255 ft.

Ganges Township: Dale M. Leonard 1 Wissman, SE SE SE 32-2n-16w, Traverse 1,182 ft., dry, TD 1,269 ft.

Lee Township: Ford Oil Co. 1 Cross, SE SW NE 7-1n-15w, Traverse 1,294 ft., dry, TD 1,202 ft.

Arenac County, Lincoln Township: Don Rayburn 1 Nehls, NW NE NE 7-18n-4e, Dundee 2,828 ft., dry, TD 3,167 ft.

Crawford County, South Branch Township: James E. Duffy, Jr., 1 Floester, dry in Richfield, TD 4,462 ft.

Mason County, Riverton Township: Miller-Goff, Inc., 1 Anthony, NE SE SW Monroe, 2,287 ft., dry, TD 3,350 ft.

Kent County, Byron Township: Eric R. Schelling 1 Anderson, NW SE SW 3-5n-12w, Traverse 1,800 ft., dry, TD 1,834 ft.

Caledonia Township: W. D. Gannett 1 Thomas, SW SE SE 17-5n-10w, Traverse 1,871 ft., dry, TD 2,218 ft.

CALIFORNIA

Two Oil Areas Get Extensions

LOS ANGELES—The Edison area, Kern County, and Pyramid Hills, Kings County, have both received extensions. The most important is the Edison stepout. Bayshore Oil Co. 1 Doyle, 34-30s-29e, after being plugged back to the Chanac sands, pumped 100 bbl. of 20°-gravity oil per day. The Chanac was topped at 3,905 ft., Santa Margarita at 4,220 ft., and schist at 4,327 ft. Plugged depth is 4,025 ft., total depth 4,332 ft.

Fairview Exploration Co.'s 5-A well gives a ¼-mile northeast extension to present Pyramid Hills production. Although shallow total depth is 671 ft., the well is producing from the Temblor. Production is 18 bbl. of 23°-gravity oil per day, pumping. Location is in Section 17-24s-18e.

At Arroyo Grande, San Luis Obispo County, C. W. Colgrove added to the productive area, completing his 2-5 McDonald, 5-23s-13e, pumping 75 bbl. of oil per day. Total depth is 3,945 ft.

First tests on Humble Oil & Refining Co. 2 Theo. E. Hammond, in Ventura County's Ojai area, showed gas in 6 minutes and oil in 35. The interval tested was 3,935-4,020 ft. This well offsets the company's discovery, 1 Theo. E. Hammond, made last June. Both wells are in Section 18-4n-22w. Humble's 1 Berylwood Investment Co. B, in the same section, is now plugged to 3,980 ft. after reaching 5,994 ft. This offset is idle waiting on orders.

In the Guijarral Hills area, Signal Oil & Gas Co. has staked location for the 1 Craig-Bourdieu, Section 1-21s-16e. This is one location south of present production. One previous test in this section, Standard Oil Co. 1 Bourdieu, bottomed at 10,868 ft., was dry. Southern California Petroleum Co. completed 110 Adams-Aguirre in Ramona field, Ventura County, for 130 bbl. of oil daily. Total depth is 4,810 ft. This leaves four locations to be drilled on this lease.

A contract for a 10,000-ft. test in the Trico gas field has been given Rocky Mountain Drilling Co. The test is Trico Oil & Gas Co. 55 Trico Farms, located in Section 27-24s-23e.

CALIFORNIA WILDCAT FAILURES

Fresno County, Gill Ranch area: L. M. Lockhart 1 Kerckhoff, 32-13s-17e, dry, TD 6,310 ft., elev. 222 ft.

Kern County, Edison area: Hogan Petro-

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leum Co. 1 Bloemer, 7-30s-29e, dry, TD 3,341 ft. in gray sand, elev. 480 ft.

Plieto Hills area: Richfield Oil Corp. 1 Plieto Hills, 6-10n-20w, dry, TD 7,379 ft., elev. 2,819 ft.

Poso Creek area: Rothschild Oil Co. 1 U. S., 20-27s-27e, dry, R zone 2,127 ft., TD 2,190 ft., elev. unknown.

Standard Oil Co. 31 Fred Smith, 34-27s-27e, dry, Vedder 3,918 ft., Olcese 2,645 ft., TD 4,220 ft. in gray sand, elev. 694 ft.

Tejon area: Charles Holmes No. G-3, 18-11n-17w, dry, granite 477 ft., TD 487 ft., elev. 1,194 ft.

Los Angeles County, Newhall area: E. M. Breen 1 Betsy Linda, 1-3n-16w, dry, TD 2,830 ft., elev. 1,378 ft.

Santa Barbara County, Tupusquet Creek area: Evans Carter & Assoc. 2 Rancho Viejo, 3-9n-32w, TD 2,058 ft., elev. unknown.

APPALACHIAN FIELD

Pennsylvania Deep Well Shut Down to Run Casing

PITTSBURGH. — In Wharton Township, Fayette County, Pennsylvania, William E. Snee et al 3 Indian Creek Coal & Coke Co., elevation 2,615 ft., is shut down in the top of the chert at 7,012 ft. to run 7-in. casing. The top of the Onondaga in this well was recorded at 6,994 ft. In Napier Township, Bedford County, South Penn et al, Snee & Eberly 1 Jesse B. Miller, elevation 1,666 ft., has resumed drilling and is at a depth of 5,521 ft. In Croyle Township, Cambria County, Peoples Natural Gas Co. 1-3878 Joseph Gavany is at a depth of 2,319 ft., and in Derry Township, Westmoreland County, Peoples Natural Gas Co. 4-3814 Camilla Giffen is shut down at a depth of 9,047 ft. to change wire line.

In West Virginia, Columbian Carbon Co. has made location for an Oriskany sand test, the 1140 F. B. Allman et al, elevation 948 ft. It is located in Steele district, Wood County, on the Belleville Quadrangle 2.65 miles south of Lat. 39° 5′ and 3.54 miles west of Long. 81° 30′, approximately 1,716 ft. southwest of the large Barnette well recently brought in in this area. In the same section, Godfrey L. Cabot, Inc., 1301 Thomas P. Beard is drilling at 4,105 ft. and his 1313 G. P. Burkhart at 1,570 ft. In Tucker County, Godfrey L. Cabot, Inc., 1317 Thomas Hughes is drilling at 675 ft. In Union district, Jackson County, Cottageville Gas Co. brought in a good shallow gas well in the shale, the 1 James Ohse et al, gaging 1,220,000 cu. ft., total depth 3,585 ft. In Clay district, Hancock County, John T. Galey 1 Karol & Catherine Sobel, elevation 1,066 ft., is drilling at 4,050 ft., and in Portland district, Preston County, Snee & Eberly 2 Cora E. Lewis, elevation 1,953 ft., is drilling at 5,035 ft.

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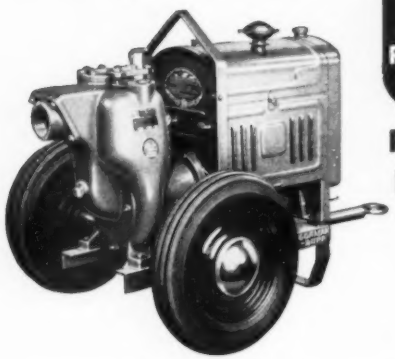

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CANADIAN FIELDS

O'Meara-Barrhead Confirms Success

CALGARY. — O'Meara Canadian Drilling Co. has its initial oil success on a farmout from Imperial Oil, Ltd., and Stanolind Oil & Gas Co. at Barrhead, in northwest Alberta. The O'Meara-Barrhead 1, LSD 2, 15-58-5w5, about 57 miles northwest of Edmonton, completed in the Madison limestone and flowed 30 bbl. of oil hourly during a 2-hour open flow test. Gas flow measured between 2,000,000-3,000,000 cu. ft. daily. Fluid recovery was about 90 per cent heavy crude oil with gravity range of 22°-24°, and 10 per cent basic sediment and water.

The new well, about ¼ mile north of Stanolind-Imperial-Barrhead 1 discovery, will be shut in temporarily while rig is dismanteld to be moved to next site and production equipment is installed. The well set casing at bottom 4,020 ft., perforated interval at 3,973-81 ft. with 24 shots, and was acidized with 200 gal. prior to swabbing. The next location by O'Meara has been staked in LSD 7, 9-59-5w5, on a separate seismic feature about 5½ miles north of the first success.

The Cardiff-Edmonton Oil Syndicate (Trust) received a natural gas flow of 1,500,000 cu. ft. daily at its initial exploratory test located on an Imperial Oil, Ltd., farmout. The Cardiff-Giant 1, LSD 9, 26-55-25w4, about 4½ miles southwest of Imperial's Excelsior oil discovery, ran a drill-stem test in what was believed to be the top of the Viking sand or bottom of the Colorado formation. The interval tested was 2,807-16 ft., and gas flow was 1,500,000 cu. ft. daily with no oil or water showing when the pipe was pulled. Drilling is now proceeding at 3,531 ft.

Canadian Gulf Oil Co. has assured oil production in the Devonian D2 zone at its Ellis 6, situated about ⅜ mile northeast of the company's Stettler oil discovery. The well, LSD 6, 10-38-20w4, ran a 30-minute drill-stem test at 5,182-5,207 ft. and recovered 2,450 ft. of oil. The crew is now drilling in search of the D3 zone at 5,227 ft., in efforts to determine whether that horizon will also be productive as was the case at the nearby dual zone discovery well, Gulf-Ellis 4 in LSD 4.

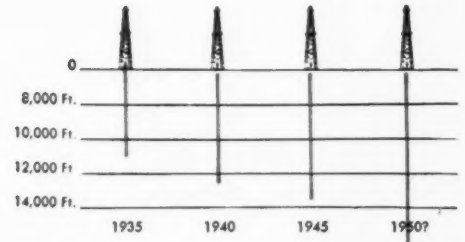
CANADIAN WILDCAT FAILURES

Jarrow 2, LSD 12, 20-45-10w4, TD 2,766 ft.
Strathford 1, LSD 13, 17-29-13w4, TD 5,002 ft.
Stanolind-Plum Lake 1, LSD 14, 26-64-21w4, TD 3,800 ft.
Gulf-Michel 4, LSD 4, 25-54-27w4, TD 5,390 ft.

EASTERN CANADA

Gaspe.—Results of initial acid treatment by Dow Inc. of three wells on the Gaspe

FOR *Deeper Drilling...*



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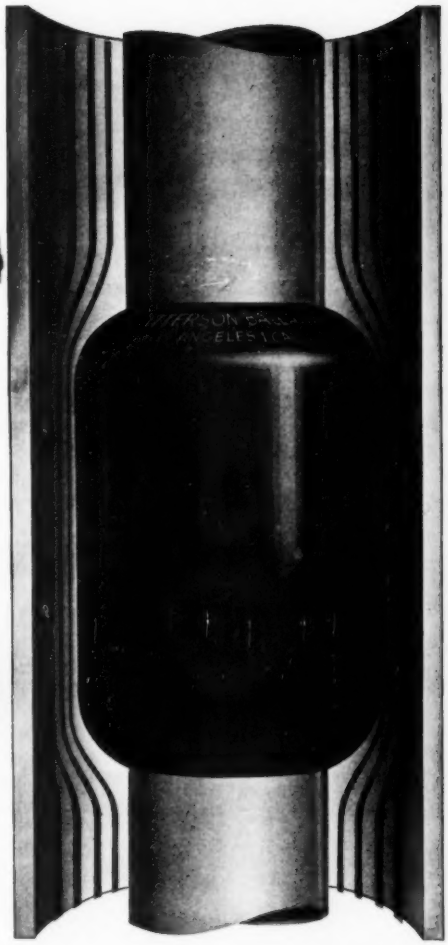

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Peninsula, Quebec, indicate possibilities of commercial production. Imperial-Gaspe 1, on the Bald Mountain anticline, was swabbed after 500-gal. treatment, recovering 10-15 bbl. of new crude with wet gas. Treated with 1,000 gal., it developed between 1,000,000-2,000,000 cu. ft. of wet gas while swabbing, later returning 15 bbl. of asphaltic crude.

Venture 3, on the Galt anticline, developed little pressure after initial treatments of 200 gal. and 500 gal. After 1,000 gal., the well returned all input crude and some acid when it began to return quantities of medium, light green, paraffin-base crude.

Continental-Gaspe 1, on the Galt Brook dome, after initial 1,000-gal treatment, returned input crude and some acid water, with no yield of oil ar gas indicated. After several days interruption due to weather, the well started to make high gravity, paraffin-base, green crude at about 12 bbl. a day, and increasing with considerable gas pressure. Testing is still in progress.

LA.-ARK.

Sligo Field Deep Test Hits Salt at 11,295 Ft.

SHREVEPORT.—Union Producing Co. 1 Section 13 unit, 13-17n-12w, deep test in Sligo field of Bossier Parish, placed top of salt at 11,295 ft. on the basis of drill cuttings and a core from 11,301-17 ft., which returned 10 ft. of salt. Elevation is 214 ft. and total depth was 11,317 ft. According to report, the salt is overlain by some 2,500 ft. of Cotton Valley shale, with no Smackover lime present.

Petersen Drilling Co. 1 Breece Lumber Co., Ouachita Parish wildcat in 30-17n-5e, had total depth at 6,516 ft., in the Travis Peak. On a drill-stem test of perforations from 6,118-28 ft. it flowed salt water with a slight show of gas, then plug was set at 6,100 ft. A test of perforations in the Pettit lime from 5,028-38 ft. flowed an estimated 5,000,000 cu. ft. of gas daily, plus an unestimated amount of salt water. At last report operators were attempting to shut off the flow of salt water.

NORTH LOUISIANA SUCCESSFUL WILDCAT

Concordia Parish: R. A. Campbell 1 R. T. Harriss, 18-7n-10e, TD 6,732 ft., elev. 60 ft., Wilcox 4,028 ft., perf. 24 shots 5,665-68 ft., flowed 120 bbl. of 42°-gravity oil a day, ¼-in. choke, GOR 500 cu. ft., flowing TP 650 psi.

NORTH LOUISIANA WILDCAT FAILURES

Caddo Parish: J. S. Henderson 1 R. O. Roy, 35-19n-15w, dry, TD 2,804 ft., elev. 311 ft., PB 1,110 ft., Nacatoch 1,058-76 ft.

Concordia Parish: Danciger Oil & Refining Co. 1 Pittsfield Plantation, 42-8n-10e, dry, TD 6,913 ft., elev. 71 ft., Cockfield 1,441 ft., Cook Mountain 2,043 ft., Sparta 2,220 ft., Cane River 3,122 ft., Midway 6,556 ft.

East Carroll Parish: Petersen Drilling Co. 1 A. B. Learned, 3-18n-13e, dry, TD 4,225 ft., elev. 100 ft., Cane River 1,858 ft., Wilcox 2,205 ft., Midway 3,434 ft., gas rock 3,885-96 ft., Paluxy 3,896 ft.

ARKANSAS WILDCAT FAILURES

Union County: T. L. James & Co. 1 F. M. Nunally, SE NE 19-19s-12w, dry, TD 2,391 ft., elev. 222 ft., Wilcox 1,207 ft., Midway 1,612 ft., Arkadelphia 2,120 ft., Nacatoch 2,220 ft., sand 2,322-49 ft.

Curtis A. Kinard 1 Cook est., NE SE 3-16s-18w, dry, TD 3,632 ft., elev. 145 ft., Nacatoch 1,746 ft., Tokio 2,658 ft., James 3,032-91 ft.

TEXAS GULF COAST

New Horizon Produces Oil In East McFaddin Gas Area

HOUSTON.—The Union Producing Co.'s A-10 McFaddin, oil discovery in East McFaddin field, Victoria County, flowed 121 bbl. of 36.1°-gravity oil daily through a 3 16-in. choke from 5,625-27 ft. Casing pressure was 995 psi. and tubing pressure was 795 psi. Hole is bottomed at 6,415 ft. Previous production (gas) in the field has been from the 5,900-ft. level.

Kirkwood & Co. et al have perforated the 1 J. E. Stubbs estate, prospective discovery in Victoria County, from 4,883-87 ft. and started cleaning gas, wash water, and mud with 500 psi. tubing pressure and 750 psi. casing pressure. The well cored broken sand at 4,883-98 ft., with the upper part showing gas and the lower part showing saturation. The test is located 1½ miles south of Victoria field.

Cities Service Oil Co. got its first producer in the new deep producing area at South Dayton, on the south flank of the South Liberty salt dome, Liberty County. The 1 J. Riviere estate was completed through perforations at 8,430-64 ft. This deep sand was discovered about a year ago by Gulf Oil Corp. which now has four good producers in the field.

TEXAS GULF COAST (DISTRICTS 2 AND 3) SUCCESSFUL WILDCATS

Austin County: New gas discovery, New Ulm area—McCarthy Oil & Gas Corp. 1 Adolph Weige, James Tylee Sur., A-304, top pay 9,668 ft., perf. 9,668-90 ft., TD 11,071 ft., 9,000,000 cu. ft. of gas per day open flow, SIP 2,595 psi.

Calhoun County: New gas discovery—John W. Mecon 3 Minnie S. Welder, SA&MGRR Sur. 3, 3 mi. NE Heyser field, TD 9,105 ft., perf. 5,750-55 ft., no gage, SIP 2,700 psi.

Tyler County: New oil pool—P. T. Sharples 1 D. D. Swearingen, W. R. Parker Sur., 6 mi. E NE Warren, 3¾ mi. S East Hillister field, top sand 5,696 ft., perf. 5,696-97 ft., TD 9,371 ft., 120 bbl. of 46°-gravity oil per day, 6 64-in. choke, GOR 950, TP 950 psi.

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Victoria County: New oil discovery, East McFaddin—Union Producing Co. et al A-10 McFaddin et al, C. O. Edwards Sur., top pay 5,624 ft., TD 6,415 ft., perf. 5,625-27 ft., 120 bbl. of 36.1°-gravity oil per day, 1/7-in. choke, GOR 585, TP 795 psi., CP 995 psi.

TEXAS GULF COAST (DISTRICTS 2 AND 3) WILDCAT FAILURES

Austin County: The Texas Co. 1 Paul Kollatschny NCT-1, F. Thompson Sur., A-389, 2 mi. SE Cats Springs, dry, TD 11,011 ft.

Hardin County: Houston Oil Co. of Texas and American Republics Corp. 1 J. J. Settegast et al, H&TC Sur. 233, A-321, 4½ mi. SW Village Mills, dry, TD 10,001 ft.

Jackson County: Prince Drilling Co., Inc., 1 Simon & Seidel, Ramon Musquiz Sur., 1½ mi. E Vanderbilt, dry, TD 7,425 ft.

Karnes County: Kirkwood & Morgan, Inc., 1 Herman, John W. Clifton Sur., 7 mi. N NE Fashing, dry, TD 3,951 ft.

Wilson County: Frank J. Gravis et al 1 J. H. McDaniel, Luis Manchaca Sur., 2 mi. SW Poth, dry, TD 5,001 ft.

EASTERN TEXAS

Pine Mills Field Outpost In Wood County Is Failure

DALLAS.—Additional development drilling, and a northeast outpost failure were reported this week for the Pine Mills field of Wood County.

The ⅝-mile northeast stepout test was F. R. Jackson and associates 1 G. W. Reed, E. C. Lane Survey, which had total depth at 6,770 ft., with no shows. Elevation was 426 ft. Woodbine top was not reported; Austin, by samples, was placed from 4,937-5,135 ft.

New development work getting under way, and planned, included Jackson's test on the N. M. Kennedy 15-acre tract, David Gilleland Survey, approximately 730 ft. east of the 1 J. A. Durrett, discovery well. Coats & Hearrell Drilling Co. was moving rig to location from the 1 Garrison wildcat. The same operators plan to drill 1 F. A. Harper, a south offset to the 2 Durrett. Sohio Petroleum Co. has started drilling at their 2 G. T. Turner, Gilleland Survey, a north extension try to the field.

A. O. Phillips 1 B. G. Staples, Paluxy wildcat 2 miles southwest of Lindale, in the J. J. Knowles Survey, Smith County, was coring ahead below 7,623 ft. Top on the Paluxy was placed at 7,621 ft., by samples, on elevation of 570 ft. It was said to be slightly high on the section to producing wells in the Bud Lee field, 3 miles to the southwest. There was no recovery on first two core attempts below the Paluxy.

In the Red Springs field of Smith County, Humble Oil & Refining Co. 1 A. E. Forston and others, 6 miles northwest of Winona, in the William Price Survey, and 2,900 ft. of the 1 Winters discovery well, completed for a daily production of 1,140,000 cu. ft. of gas a day, open flow, plus an estimated 50 bbl. of distillate per 1,000,000 cu. ft. Total depth was 10,461 ft.

EAST TEXAS (DISTRICTS 5, 6, AND 6-P) WILDCAT FAILURES

Hunt County: Morris Palmer 1 Annie Pritchard, N. Voyles Sur., 8 mi. SE Greenville, dry, TD 2,900 ft., elev. 484 ft.

Leon County: The Texas Co. 1 Charles Prasifka, A. H. Heatley Sur., 2 mi. NE Keechi, dry, TD 5,865 ft., Austin 5,166-5,452 ft., Woodbine around 5,745 ft.

Navarro County: Walter Ballard 1 A. P. Mays, John McNeill Sur., 10 mi. SW Corsicana, dry, TD 390 ft.

Red River County: H. H. Bowde, Clarence Welch and Claude Smith 1 Clarence Welch, J. Calloway Sur., 5 mi. W Clarksville, dry, TD 3,087 ft. in Glen Rose., elev. 435 ft., Goodland 2,016 ft., Paluxy 2,027 ft., Massive anhydrite 2,890 ft.

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OHIO, KENTUCKY

Wayne County Venture Gets Open Flow of Gas

COLUMBUS.—Smally & Blood 1 Wayne Yannayan, Section 18, Congress Township, Wayne County, topped the Newburg sand at 2,650 ft. and stopped in sand at 2,732 ft. with an open flow of 440,000 cu. ft. of gas natural. After being acidized with 3,000 gal., the flow increased to 2,240,000 cu. ft. the third day. In the same section, Ditch & Gerig 2 G. Ramsier found the Newburg at 2,670-2,770 ft. with only 53,000 cu. ft. of gas and the Clinton sand dry. The hole will be plugged back and the Newburg acidized.

J. B. Grogg and Son moved ½ mile west of their discovery in Knox Township, Vinton County, and drilled 1 ft. into the Berea sand on the 1 Jacob Lyons, Section 25. In 1 hour the hole filled up 250 ft. with oil and the well has been shut down for testing.

The Foraker Drilling-Sidwell 2 Sipos, Section 36, York Township, Morgan County, flowed 70 bbl. in the first 24-hour test after shot.

Frank Lyons 3 Hastings, Section 35, Jackson Township, Ashland County, gaged 10,000 cu. ft. of gas in the Newburg at 2,672-2,700 ft. and 103,000 cu. ft. in the Clinton at 2,938-41 ft. The Newburg will be acidized and the Clinton shot.

OHIO WILDCAT FAILURE

Mahoning County, Goshen Township: D. B. McCune 1 fee, Sec. 14, Clinton 5,354-94 ft., dry, TD 5,406 ft.

WESTERN KENTUCKY

OWENSBORO.—Kingwood Oil Co. 3 Dunn-Leach, second confirmation test for the East Reed pool, in 15-Q-27, eastern Henderson County, swabbed 3 bbl. of oil and 2 bbl. of water in the first 3 hours while testing the new pool's Waltersburg sand pay at 1,186-1,200 ft. A fourth well for the pool also is in prospect at 4 Dunn-Leach, 550 ft. soutnwest of the discovery well, where 235 ft. of clean oil was recovered in a drill-stem test of the sand at 1,186-92 ft., and where casing has been run for completion. The pool was opened late in November. A fifth test is drilling.

Iley B. Browning 1 Osborn Heirs, NE SW SE 13-N-23, Webster County, which extends the Pogle Consolidated pool ¾ mile to the south, has been completed pumping 105 bbl. per day from Hardinsburg sand at 2,004-20 ft. Previously, it also had swabbed at the rate of 1½ bbl. of oil per hour from Palestine sand at 1,825-31 ft., but completion is in the lower zone only.

EASTERN KENTUCKY

ASHLAND.—In extreme southern Boyd County and along the Lawrence County line W. S. Perry et al are still in the process of cleaning out at their 1 Phil Preece, located in 5-U-82. Topping the Berea sand at 1,758 ft. with a show of oil, operators bottomed at 1,844 ft. and followed with a 170-qt. shot. Following cleaning out operations the well will likely be put on production tests.

In Madison County, 11-P-61, Coolie Ellis et al are drilling at 2,450 ft. at 1 State Bank of Richmond, a rank wildcat probing for deep pays. Very little information has been released on this test but it is understood that operators are currently drilling in the Knox dolomite.

In Fleming County, 20-V-70, Walter Kline et al are drilling slowly ahead with cable tools at 1 James Bashford. Current depth is 1,468 ft. still in the Highbridge (Ordovician) series. St. Peter and Knox equivalents are expected shortly.

EASTERN KENTUCKY WILDCAT FAILURE

Owsley County: Roy Barnes et al 1 Nannie Campbell, 19-L-70, Zeke's Branch of Meadow Creek, dry, TD 1,426 ft., Big lime 660 ft., Black shale 1,160 ft., Corniferous lime 1,349 ft., show oil and hole full water.

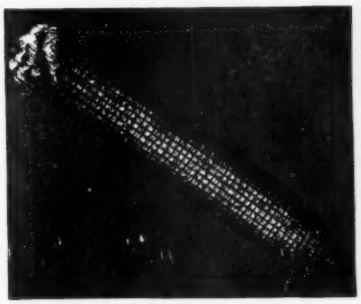
INDIANA

EVANSVILLE.—Opening not only another new pool but also a deeper pay zone for the general area, Coy Oil Co. 1 Montgomery, NW NE SE 18-3s-11w, 1½ miles south of Owensville, in Gibson County, flowed 20 bbl. an hour for the first 12 hours, and then swabbed 136 bbl. per day with only a trace of water in testing Salem lime found at 2,870-80 ft. Previous deepest production for the area has been the McClosky lime, about 200 ft. shallower. Hole was drilled to 2,908 ft., where casing was run and then perforated. The discovery is about a mile south of production in the active Owensville East pool, opened last July. Other production is located about a mile to the east and also about a mile to the west, in the Owensville South pool.

National Associated Petroleum Co. 1 Meuer, SE SW NE 2-4n-7w, about a mile north of Plainville, in Daviess County, and about 12 miles from nearest oil production, is reported to have swabbed 7 bbl. of oil per hour while testing in McClosky lime at 732-41 ft. A possible dual discovery is indicated at the same location, where 1-A Meuer, twin to No. 1, encountered strong gas pressures in a lower pay, the Salem lime, at 1,157-92 ft. This well blew out of control for a time with flow estimated at 3,500,000 cu. ft. per day.

In Martin County, Carl Miles has another prospective gas discovery in his 1 Crane, NE SW SW 4-3n-4w, 3½ miles northeast of Loogootee, where testing of the Chatt shale, found at 1,495-1,520 ft., is under way. Gas encountered while drilling this zone blew the mud out of the hole before being

(Continued on page 334)



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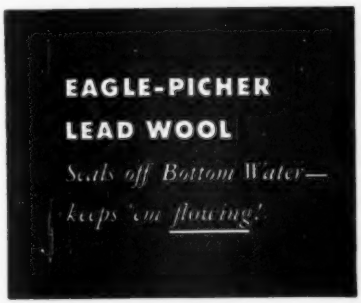

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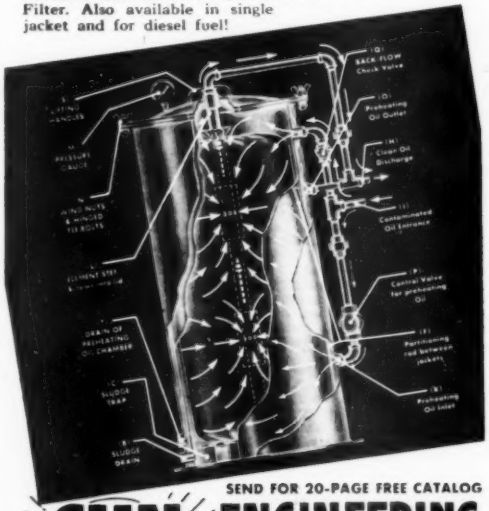
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OKLAHOMA

Four Okfuskee County Areas Show for New Production

MID-CONTINENT PETROLEUM CORP. 1 Fleming, SE SW NE 9-11n-11e, prospective new pool opener, 2 miles southeast of the Southeast Blakely pool, Okfuskee County, swabbed 80 bbl. of oil in 16 hours while cleaning out after a 20-qt. shot. Prior to shooting, it had swabbed 60 bbl. in the first 12 hours with production dropping to 46 bbl. in the next 18 hours. The well has open hole from 3,650 ft. to 3,708 ft., taking in the Dense section, topped at 3,669 ft.; the dolomite, topped at 3,672 ft.; and the first Wilcox, topped at 3,694 ft.

In the same county, Aurora Gasoline Co. 1 Turner, NE SE SW 6-12n-8e, 4 miles west of the Valley Grove pool, encountered promising oil showings in Cromwell sand, a drill-stem of which, at 3,671-89 ft., gave a recovery of 210 ft. of clean oil, 180 ft. of heavy oil and gas-cut mud, and 5 ft. of brackish water. Indicated bottom-hole pressure was 200 psi. With well shut in, pressure built up to 1,050 psi. Currently, hole is drilling ahead.

Also in Okfuskee County, F. A. Gillespie & Sons 1 Meredith, NE NE NE 10-12n-9e, 1½ miles north of the Northeast Castle pool, is showing for another new discovery following a drill-stem test at 3,289-3,300 ft., in Gilcrease sand topped at 3,288 ft. During the test, the well sprayed oil, and while pulling tester, 1,800 ft. of clean, but black oil was recovered. No water was indicated.

T. A. Manhart 1 Palmer, SE SE SW 27-10n-9e, a mile northwest of production in the Papoose field, also in Okfuskee County, flowed at an estimated rate of about 6,000,000 cu. ft. of gas daily in a drill-stem test of Cromwell sand at 3,324-43 ft. and has run casing to the top of the pay for completion. Testing tool was open 1 hour.

In Creek County, production of the Olive district has been extended eastward and a new pay zone, the Dutcher sand, opened by An-Son Petroleum Co. at its 1 Beaver, SW SW NE 12-17n-8e, which flowed 200 bbl. of oil and an estimated 1,000,000 cu. ft. of gas in 24 hours through casing. Production is from casing perforations at 2,936-44 ft.

A new and deeper pay zone, the Oil Creek sand, has been proved in the Southwest Lone Grove pool, Carter County. George D. Blaylock and associates 1 Duke, SW NE NW 5-5s-1w, located at the north edge of this pool, flowed 216 bbl. of 31° oil per day through open tubing from this sand, in which casing had been perforated at 4,636-80 ft. Total depth is 4,777 ft., with 7-in. casing at 4,704 ft.

OKLAHOMA SUCCESSFUL WILDCATS

Garvin County: Walker, Pray and Morgan 2 Pratt, C SE SE 20-4n-3w, IP 446 bbl., Gibson sand, 7,344-84 ft., TD 7,431 ft.

Major County: Mazda 1 Lewis, NE NW NW 4-21n-10w, flowed 150 bbl. of oil from Manning, 6,802-90 ft., TD 6,900 ft.

Champlin Refining Co. 1 Werner, NE NW SW 29-22n-10w, IP 71 bbl., Maning, 6,787-856 ft., TD 6,885 ft.

Beckham County: Wilcox 2 Walker, C SW NW 24-10n-21w, flowed 1,200 bbl. with 1,800,000 cu. ft. of gas, conglomerate and sand, 9,305-10 ft., TD 10,108 ft.

OKLAHOMA WILDCAT FAILURES

Cleveland County: Josoline Producing Co. 1 Pah-Koh-Nay, NW SW NW 13-9n-1e, dry, TD 5,720 ft.

Comanche County: McLennan 1 Lewis, SE SE SE 26-1n-10w, dry, TD 2,964 ft.

Dewitt 2 Conner, SE SE NW 23-1n-11w, dry, TD 1,202 ft.

Cotton County: Hutchinson 2 Larse, SW SW SW 33-3s-12w, dry, TD 4,625 ft.

Creek County: Mid-Continent Petroleum Corp. 1 Estate Land Co., NE SE NE 19-16n-7e, dry, TD 3,923 ft.

Hughes County: Murta et al 1 Coachman, NE SE SW 9-9n-11e, dry, TD 2,992 ft.

(Continued on page 333)

ILLINOIS

Biehl Sand Pay Extension Indicated for Omaha Pool

MATTOON.—A substantial northward extension of Biehl sand production in the Omaha pool, in Gallatin County, is indicated by drill-stem tests at C. H. Murdick and associates 1 Dixon, NW SW SE 27-7s-8e. The well found the sand at 1,493-1,505 ft., and in the test, with tool open 90 minutes, 360 ft. of clean oil and 660 ft. of heavily oil-cut mud was recovered. An additional 120 ft. of fresh water also was obtained. Casing was run to the top of the pay.

Carter Oil Co. has completed its fourth well in its recently opened Thompsonville East pool, in southeastern Franklin County. No. 3 Trustee Tract 8, NW NW NE 12-7s-4e, a location north of the discovery well, pumped 264 bbl. of oil and 6 bbl. of water daily from the pool's Aux Vases sand pay.

About 2 miles to the northeast in southwestern Hamilton County, where another Aux Vases sand pool was opened late in November by J. W. Everhart 1 Wesley Foundation, a confirming completion has been made by B. J. Taylor and associates at their 1 Lowe, NE NE NE 7-7s-5e. The latter well, a southwest offset to the Everhart discovery well, pumped and flowed 360 bbl. of oil per day with the pay at 3,198-3,210 ft. A third well for this area seems assured at Phillips Petroleum Co. 1 Angus, SE SE SE 6-7s-5e, east offset to the discovery well and north offset to the new Taylor producer. Testing the Aux Vases sand at 3,184-3,208 ft., it swabbed at the rate of 14 bbl. per hour. J. W. Everhart 2 Wesley Foundation, NE SW SW 5-7s-5e, a location northeast of the discovery well, also is expected to make a well although

(Continued on page 333)

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Oil-Emulsion Mud

(Continued from page 152)

to convert to oil-emulsion upon entering the producing sand sections and after setting the oil-string casing. Therefore, all comparative performances are recorded between the conventional and oil-emulsion mud while drilling the 350 to 550-ft. pay-section sand.

As can be observed in Table 1, the six wells drilled using conventional clay-base mud have a consistently lower average rate of penetration in the pay section than the eight wells drilled in the pay section with oil-emulsion. The average for individual wells follows the over-all average for each group. Lithology of the sand sections was very similar.

Standard practice in drilling wells in the Lake Basin has been and is at present to underream the producing sand section after reaching total depth. The hole drilled in the 14 wells listed in Table 2 was $7\frac{3}{4}$ in., all of which were underreamed to $8\frac{5}{8}$ in. It will be noted that time for underreaming was materially reduced for the eight wells using oil-emulsion. During 1946 standard procedure was to underream twice in hopes of decreasing the possibilities of liner becoming stuck during completion process. After use of oil-emulsion mud for drilling the pay section began in 1947, it was found that underreaming once was sufficient.

Ordinarily $6\frac{5}{8}$-in. o.d. screen liner is run following the completion of underreaming. In all 14 wells of Table 2, there occurred only one case of liner becoming stuck. Even though this one example is insufficient proof, the fact that no liner became stuck in the eight wells employing oil-emulsion mud tends to show that the holes were left in better condition than with conventional mud. Perhaps the lubricative properties of the oil-emulsion, facilitating the running of liner through a possible "tight hole," avoided otherwise costly fishing operations and lost time.

All of the 14 wells listed in Table 2 eventually came in as natural-flow producers. Of the six drilled in the pay section and completed with conventional clay-base mud, four required swabbing. Of the eight using oil-emulsion, one had to be swabbed, but began flowing during the time that the liner was being washed.

The true indication of the success of the use of oil-emulsion mud in lake drilling and completion is concerned with over-all drilling and completion time. Table 3 presents net over-all time in days from the drilling of the cement shoe of the $8\frac{5}{8}$-in. casing until the well was placed on production. It can be observed that the net over-all time of drilling the pay section and completing the well is appreciably less for those wells using oil-emulsion mud. An interesting occurrence is recorded in Table 3. During the time the pay section of 32 Lagunilla well was being drilled a boiler exploded when pipe was on bottom. The pipe was on bottom 72 hours without any mud circulation before boiler repairs were completed, yet pipe had not become stuck.

Since electric-log interpretations are such an important consideration in geological correlations, the possible effect of the oil-emulsion on resistivity curves was studied prior to the use of the mud in Western Venezuela in 1947. Geologists have found that resistivity curves are slightly damped when a survey is conducted in oil-emulsion due to the lower resistivity differential between the well bore and the formation as compared to the conventional clay-base mud. However, correlations have been easily made between surveys conducted in oil-emulsion and in conventional clay-base muds.

Results—Deeper Drilling

In the company's deeper drilling in Western Venezuela in outlying areas of the Lake Basin, oil-emulsion mud has definitely proven its superiority over conventional clay-base mud. The hazardous Pauji shale was success-

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fully drilled with the oil-emulsion. This is the heaving shale of the Mene Grande area that brought about the development of oil-emulsion drilling fluid by Shell Caribbean Petroleum Corp. in 1943. Drilling authorities agree that in these outlying areas the shale could not have been successfully drilled with conventional clay-base mud with ordinary treatment and at a similar cost.

In the deep drilling of the Mara area, the oil-emulsion has appeared to lengthen the life of rock bits. The lubricative properties have had a beneficial effect on roller-bit-bearing life. Many drillers have thought the oil-emulsion, especially when used in the deeper, higher bottom-hole temperature wells, a detriment to pump valves. Tests were conducted in Mara and it was found that certain valves held up very satisfactorily.

In Mara Cretaceous drilling, it has been generally believed, but not proved, that the oil-emulsion offered less likelihood of contaminating and plugging limestone fractures. To date even though wells have been producers or nonproducers, usually indicated by the presence of lost circulation when drilling the limestone section regardless of the drilling fluid used, the oil-emulsion, with its liberal content of oil, could be reasonably assumed to offer less contaminative effect.

Conclusions

1. The average rate of penetration has been increased in the pay section for wells using oil-emulsion mud in the lake fields.

2. In the lake field wells using oil-emulsion, excessive underreaming preceding the running of liners has been decreased. Completions are generally easier with the oil-emulsion.

3. The over-all time to drill the pay section, complete the well, and place on production was decreased after advent of oil-emulsion mud in drilling practices in Western Venezuela lake fields.

4. With the oil-emulsion, drilling times have been good in the deeper wells. Heaving shales have been successfully drilled with oil-emulsion that would have been impossible to drill with conventional clay-base mud at a similar cost. Rock bits, especially bearings, have appeared to hold up longer when run in oil-emulsion.

5. In general, oil-emulsion has proven to be an economical, easily maintained drilling fluid for drilling to date in Western Venezuela.

Acknowledgment

Acknowledgment is made to Dr. Rodolfo J. Tailleur, chief mud engineer, Mene Grande Oil Co., Eastern Division, who during his time in Western Venezuela in 1947 and 1948 performed the early experiments with the subject mud.

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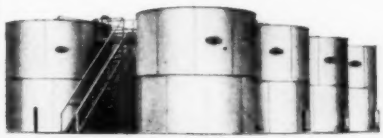
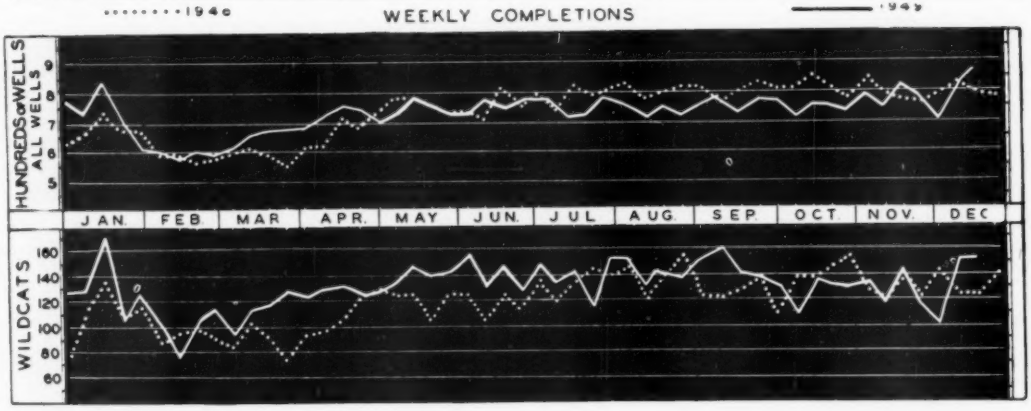
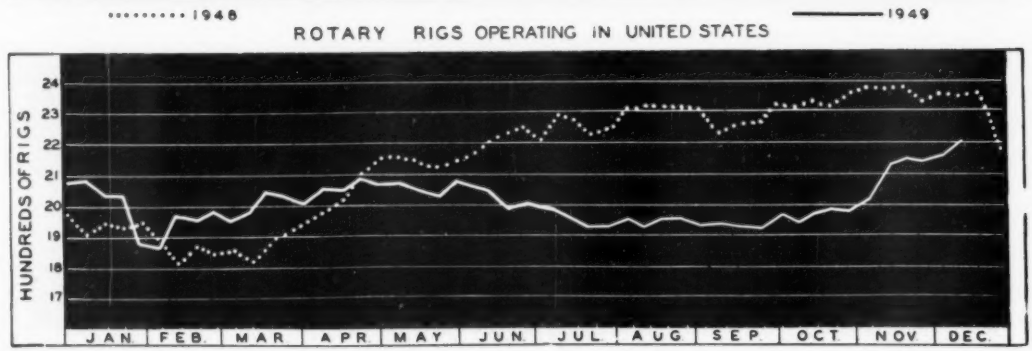


WEEKLY WELL COMPLETIONS . . WEEK ENDED DECEMBER 17, 1949

	Total of all wells					Dec. 17		Wildcat completions and discoveries					Cumulative total, 1949				
	Comp.	Oil	Gas	Dry	Footage	1949	1948	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	20	10	0	*10	30,914	723	1,428	0	0	0	0	0	0	0	1	0	1
Pennsylvania	27	12	3	†12	48,149	1,781	2,447	0	0	0	0	0	0	0	4	2	6
West Virginia	15	3	10	2	38,631	498	800	0	0	0	0	0	1	0	12	11	24
Ohio	16	4	2	‡10	37,474	1,044	1,358	0	0	0	1	1	2	0	2	30	34
Indiana	27	12	0	15	50,847	1,259	1,085	2	0	0	3	5	36	0	4	218	258
Kentucky	20	7	4	9	43,883	1,000	772	0	0	0	1	1	28	0	0	76	104
Illinois	63	30	1	32	137,846	2,671	2,435	1	0	1	18	20	63	0	4	486	553
Michigan	16	6	0	10	39,950	957	857	2	0	0	8	10	29	0	3	297	329
Kansas	83	33	13	37	247,737	3,197	3,051	4	0	0	15	19	75	0	9	408	492
Neb., Mo., Iowa	0	0	0	0	0	31	9	0	0	0	0	0	2	0	0	17	19
Oklahoma	116	65	7	§44	360,876	4,187	4,069	4	0	0	14	18	138	15	16	588	757
Texas	300	196	23	81	1,207,673	12,725	11,728	6	1	3	40	50	385	43	113	2,148	2,689
North Central (Dist. 7-B & 9)	95	71	1	23	240,281	4,260	3,690	0	0	0	7	7	172	0	19	847	1,038
West (Dist. 7-C & 8)	76	62	0	¶14	344,666	3,121	3,110	3	0	0	7	10	60	1	6	264	331
Panhandle (Dist. 10)	15	10	5	0	44,715	920	639	0	0	0	0	0	1	0	1	9	11
Eastern (Dist. 5, 6, & 6-P)	10	4	0	6	51,825	759	595	0	0	0	4	4	12	4	4	149	169
Gulf Coast (Dist. 2 & 3)	56	28	12	16	314,773	1,878	1,828	2	0	2	5	9	78	29	48	358	513
Southwest (Dist. 1 & 4)	48	21	5	22	211,413	1,787	1,866	1	1	1	17	20	62	9	35	521	627
Louisiana	71	39	9	23	357,263	2,226	2,250	1	1	0	4	6	53	21	4	197	275
Northern	43	23	9	11	134,545	1,351	1,501	1	0	0	3	4	6	3	0	95	104
Southern	28	16	0	12	222,718	875	749	0	1	0	1	2	47	18	4	102	171
Arkansas	5	2	0	3	13,378	309	301	0	0	0	2	2	3	0	1	67	71
Mississippi	5	2	1	2	28,156	319	409	0	0	0	2	2	6	2	1	101	110
Southeastern States	0	0	0	0	0	45	52	0	0	0	0	0	1	0	0	36	37
Montana	14	12	0	2	37,497	277	307	1	0	0	2	3	5	0	2	33	40
Wyoming	15	8	0	7	77,850	578	569	0	0	0	3	3	23	0	1	113	137
Colorado-Utah	3	1	0	2	12,004	133	214	1	0	0	1	2	3	0	0	66	69
New Mexico	13	7	2	4	76,013	479	579	0	0	0	3	3	13	1	2	51	67
California	42	30	1	11	133,551	2,496	2,766	0	0	0	8	8	36	0	7	431	474
Dakotas	0	0	0	0	0	18	2	0	0	0	0	0	0	0	0	15	15
Total United States	871	479	76	316	2,979,692	36,953	37,488	22	2	4	125	153	902	82	186	5,391	6,561
Total previous week	835	485	60	290	2,932,601			19	5	4	125	153	880	80	182	5,266	6,408
Total December 18, 1948	787	449	56	282	2,695,068			15	4	2	103	124	841	77	234	4,927	6,079

Service wells included: *10, †12, ‡2, §5, ¶1.





DAILY AVERAGE PRODUCTION FOR WEEK

	Dec. 17 crude oil	B. of M. Nov. demand	Dec. 10 crude oil
Alabama	1,550	1,200	1,350
Arkansas	74,150	85,000	74,650
California	868,000	850,000	867,300
Colorado	62,400	73,000	60,200
Eastern	55,800	60,900	56,000
Florida	1,000	1,000	775
Illinois	175,600	185,000	179,200
Indiana	28,000	29,000	28,600
Kansas	291,250	302,000	281,250
Kentucky	25,000	23,000	26,400
Louisiana	536,300	530,000	536,800
North Louisiana	120,700		121,200
South Louisiana	415,600		415,600
Michigan	44,100	45,000	42,900
Mississippi	102,100	108,000	93,250
Montana	25,700	25,000	25,900
Nebraska	1,450	700	1,350
New Mexico	131,800	138,000	131,800
Oklahoma	408,150	415,000	407,100
Texas	1,976,700	2,230,000	1,976,700
Dist. 1 (Southwest)	26,000		26,000
Dist. 2 (Southwest)	116,625		116,625
Dist. 4 (Southwest)	185,825		185,825
Dist. 3 (Gulf Coast)	366,775		366,775
Dist. 5 (Eastern)	33,800		33,800
Dist. 6 (Eastern)	83,900		83,900
East Texas field	236,000		236,000
Dist. 7-C (West)	51,075		51,075
Dist. 8 (West)	582,400		582,400
Dist. 7-B (W. Central)	61,375		61,375
Dist. 9 (N. Central)	140,525		140,525
Dist. 10 (Panhandle)	92,400		92,400
Utah	3,000	1,200	3,000
Wyoming	139,700	127,000	139,900
Total United States	*4,951,750	5,230,000	4,934,425
Change from previous week, up	17,325		
Canada	58,450		57,885

Total U. S. production January 1-December 17 †1,781,757,450 bbl.
Same period last year (crude plus cond.) 1,944,336,125 bbl.

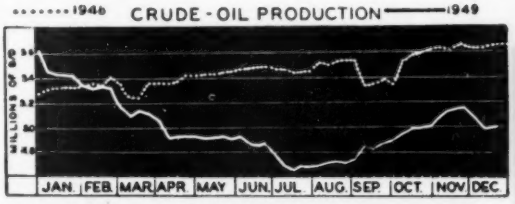
*Not incl. 82,495 bbl. condensate. †Incl. 28,859,065 bbl. condensate.

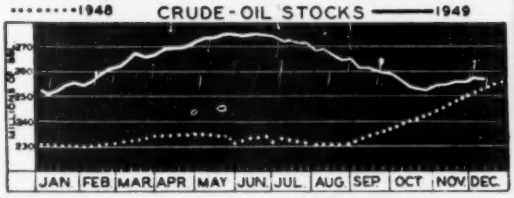
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

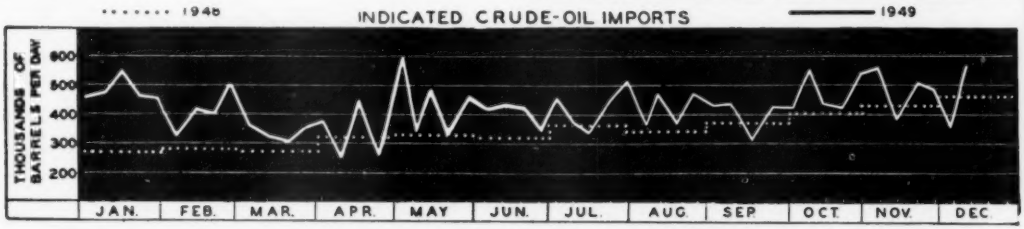
(Thousands of barrels)

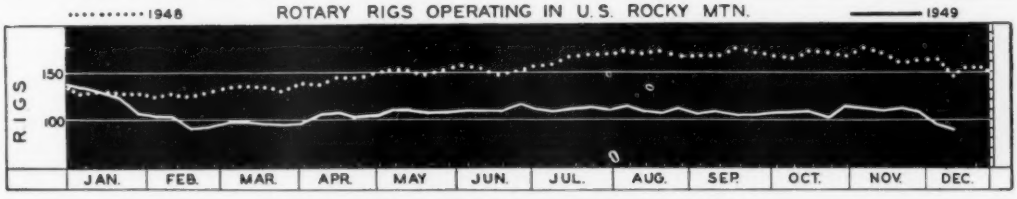
	Dec. 10, 1949	Dec. 3, 1949	Dec. 11, 1948
Pennsylvania Grade	2,932	2,973	2,911
Other Appalachian	1,778	2,014	1,443
Illinois, Indiana, Michigan	11,644	11,778	12,104
Arkansas	2,685	2,694	3,626
Louisiana	14,037	13,944	12,516
North	3,433	3,172	2,982
Gulf	10,604	10,772	9,534
Mississippi	2,475	2,593	2,620
New Mexico	7,414	7,191	6,200
Oklahoma and Kansas	37,613	37,290	35,524
Texas	116,295	119,308	116,893
East Texas	16,160	17,288	16,201
West Texas	43,783	44,086	45,268
Texas Gulf	29,621	30,766	28,672
Other Texas	26,731	27,168	26,752
Rocky Mountain	13,715	13,935	11,952
California	37,763	37,586	34,186
Foreign	8,194	7,183	7,537
Total United States	256,545	258,489	247,512

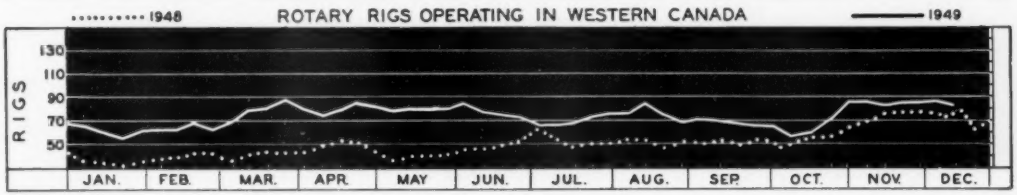
*Bureau of Mines.









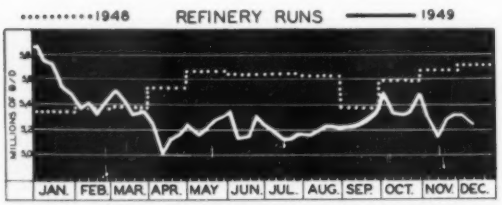


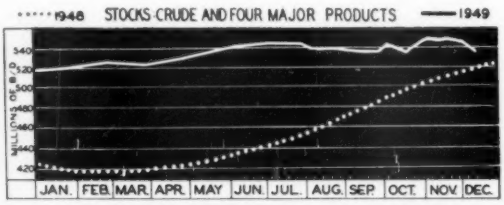
A.P.I. REFINERY REPORT, DECEMBER 10

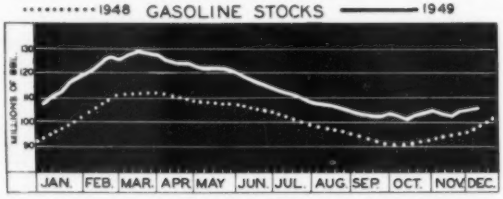
(Thousands of barrels)

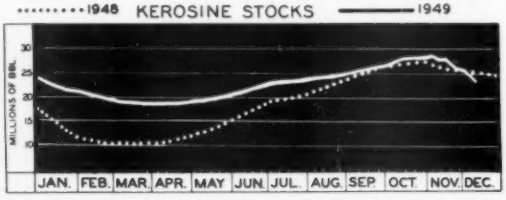
District—	Daily avg. crude runs	Daily average production				Stocks at refineries, bulk terminals, in transit and in pipe lines				Bureau of Mines, December 1948				
		Gasoline*	Kerosine	Distillate	Residual	Gasoline†	Kerosine	Distillate	Residual	Daily avg. crude runs	Daily average production			
											Gasoline*	Kerosine	Distillate	Residual
East Coast	807	347.4	16.6	201.3	197.7	22,586	9,796	26,352	9,421	856	322.9	39.8	211.4	241.5
Appalachian:														
District 1	87	40.9	4.6	14.6	10.9	2,752	365	888	396	101	45.4	7.7	15.0	14.7
District 2	63	33.4	4.1	9.7	16.1	1,312	125	238	153	72	36.4	4.9	7.9	14.5
Ind., Ill., Ky	881	463.7	66.3	152.6	165.6	21,460	4,751	12,851	3,996	939	483.1	62.5	152.7	158.7
Okla., Kans., Mo.	414	225.6	17.6	75.4	50.9	9,998	1,287	5,958	1,681	437	240.6	22.5	75.1	80.6
Inland Texas	196	134.6	7.7	23.1	38.1	3,851	688	1,218	1,229	250	162.0	14.8	22.3	59.3
Texas Gulf Coast	1,267	629.3	101.9	263.6	210.7	15,395	3,609	16,030	6,760	1,468	645.3	112.2	334.1	259.2
La. Gulf Coast	436	231.1	53.8	109.8	62.4	5,926	1,106	4,960	2,685	452	200.1	58.2	100.4	74.6
N. La. and Ark.	81	34.7	8.4	10.9	14.6	2,572	368	688	343	85	33.2	8.8	11.3	20.1
Rocky Mountain:														
New Mexico	11	6.6		1.9	2.9	87	40	92	31	14	7.5	0.5	2.1	3.7
Other Rocky Mtn.	169	83.1	5.3	31.3	35.6	2,836	370	1,970	643	152	71.6	4.3	26.4	34.9
California	822	372.3	9.1	111.1	316.4	17,371	892	14,681	37,036	965	378.1	13.8	151.7	399.9
December 10, 1949	5,234	2,602.7	295.4	1,005.3	1,121.9	106,146	23,397	85,926	64,374	5,791	2,626.2	350.0	1,110.4	1,361.7
December 3, 1949	5,329	2,589.7	315.6	966.6	1,191.7	105,264	25,151	89,448	66,271					
December 11, 1948	5,721	2,627.9	358.0	1,083.6	1,341.0	97,110	25,397	77,647	64,078					

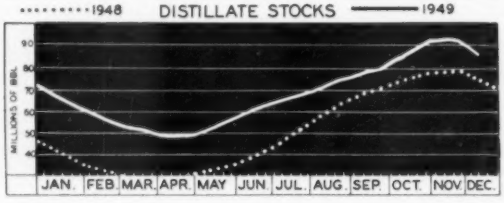
*At refineries including natural blended. †Finished and unfinished.

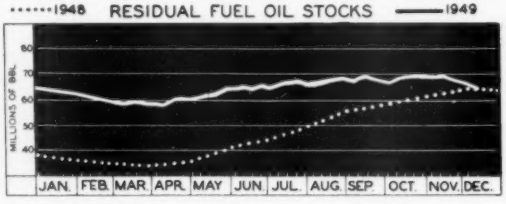


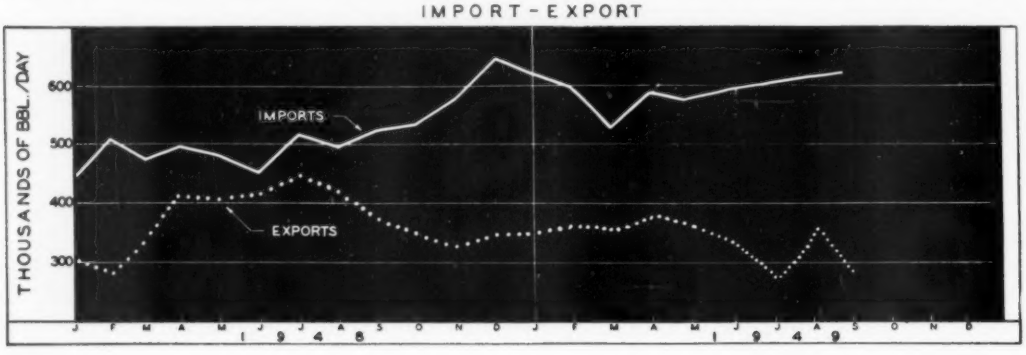












CRUDE PRICES GRAVITY SCHEDULE

Gravity—	Calif. Hill, Signal	Kansas homa, Okla-	Tex.* Coast Gulf	Tex.† West
18-18.9	$1.53			
19-19.9	1.63			
20-20.9	1.73	$2.25		$2.12
21-21.9	1.82	2.27		2.14
22-22.9	1.92	2.29		2.16
23-23.9	2.02	2.31		2.13
24-24.9	2.12	2.33	$2.56	2.20
25-25.9	2.22	2.35	2.58	2.22
26-26.9	2.31	2.37	2.60	2.24
27-27.9	2.37	2.39	2.62	2.26
28-28.9	2.42	2.41	2.64	2.28
29-29.9	2.48	2.43	2.66	2.30
30-30.9	2.54	2.45	2.68	2.32
31-31.9	2.59	2.47	2.70	2.34
32-32.9	2.64	2.49	2.72	2.36
33-33.9		2.51	2.74	2.38
34-34.9		2.53	2.76	2.40
35-35.9		2.55	2.78	2.42
36-36.9		2.57	2.80	2.44
37-37.9		2.59	2.82	2.46
38-38.9		2.61	2.84	2.48
39-39.9		2.63	2.86	2.50
40 and above		2.65	2.88	2.52

*For crude from Daboval, El Campo, and Sand Point.

†Includes Lea County, New Mexico. Last general price change represented a 50-cent increase becoming effective December 6, 1947. Above changes do not include recent reductions of a few buyers applying principally to low-gravity grades.

FLAT CRUDE PRICES

Representative posted schedules per barrel.

East Texas†	$2.65
Kettleman Hills, California*	2.77
Beauregard Parish	2.60
Illinois Basin	2.77
Pecos County, Texas (Yates)	2.35
Bradford, Pennsylvania	3.54
Eastern Ill. and Western Ind.†	2.77
Tomball, Texas Gulf Coast	2.83

*37-37.9°. †35° and above.

MARKETERS and brokers are combing the Mid-Continent area for supplies of heavy fuel oil to cover increased demand in the lake areas. At first, the shortage was in low-sulfur residual but now buyers are even out hunting material with higher sulfur content. They are having about as much trouble finding it on the open market as suppliers had finding customers for it early last summer. The big jump in demand is reflected in better prices. Some of the Group 3 residual that moved last summer for less than 60 cents a barrel would bring about $1.10 now.

Movement of No. 2 distillate fuel continues good in the Mid-Continent area. Prices on the open market are up from ⅛ cent to ¼ cent per gallon. One supplier remarked that it will take increases in both refinery runs and distillate yields to meet the demands for the winter.

Esso Standard Oil Co. raised its posted kerosine price in the Gulf from 7½ cents to 7¾ cents per gallon. Inability to purchase needed kerosine at the old price level was given as the reason for the increase. Total kerosine stocks dropped 1,754,000 bbl. or 7 per cent in the week ended December 10. This brings the inventory level to about 2,000,000 bbl. below the same period last year. Required working inventory amounts to about 10,000,000 bbl., leaving 13,000,000 bbl. subject to call in meeting demands for the winter.

Most refiners are not expecting too much improvement in realization from a barrel of crude since gains in burning oil prices are offset by decreases in gasoline prices and in gasoline production. The present indicators of the seasonally weak gasoline market are reports of price cutting at the service station level.

REPRESENTATIVE QUOTATIONS

Representative spot-market quotations of leading suppliers as of December 19, 1949. Figures are f.o.b plant for tank-car shipments in cents per gallon, except for residual fuel oil which shows the price per barrel and wax, in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Tex. Gulf Coast
Regular gasoline, 74-76 octane	9½-10	10.625-11.1	9¼-9¾
Premium gasoline, 78-80 octane	10⅜-11	12-12.1	10-10¾
42-44 w.w. kerosine	7⅝-8¼	8.9-9	7¾-8
No. 2 straw fuel oil	7-7¼	8.2-8.5	7-7¼
No. 6 residual	$1.10-1.15	$2.05	$1.65-1.75

NATURAL GASOLINE

	Group 3	North Texas	N. La
Grade 26-70	5⅞	5⅜	5⅝
Grade 18-55	7.1	6.8	6.8

LUBRICATING OILS SOUTH TEXAS

200 vis., No. 2-3 neutral	10.5
750 vis., No. 3-4 neutral	12.75
2,000 No. 5-6 neutral	14-14.5

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	17-19
200 vis., No. 3 neutral, 0-10 pp.	11.5-14

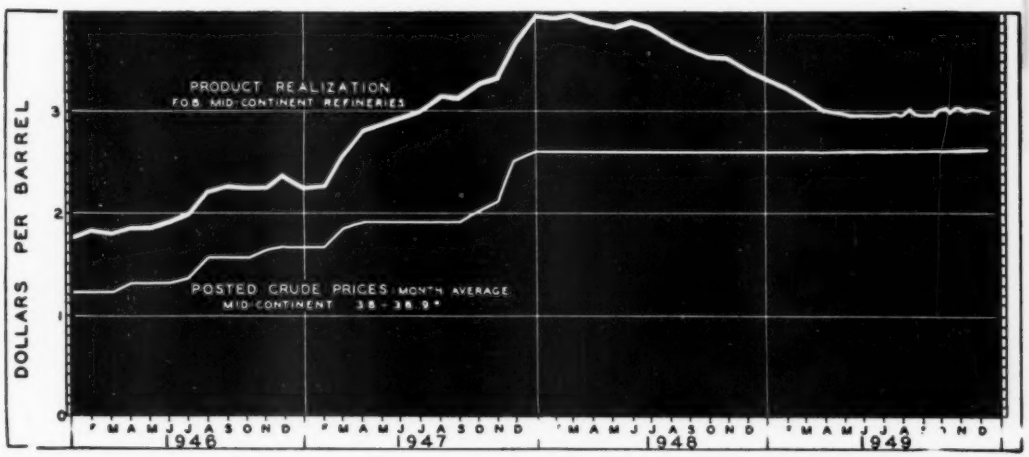
Western Pennsylvania

145-155 vis., 10 p.t. bright stock	19.5-20.5
180 vis., 0 p.t. neutral	20.5-21.5

WAX

Mid-Continent

132-134 A.M.P.	4.25



In this trend chart refinery realization is based on average Mid-Continent grade crude oil (not 38° gravity only) and average prices for refinery products as published in The Oil and Gas Journal basis Oklahoma (Group 3). Refinery yields confined to gasoline, kerosine, distillate, and fuel oil

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Yes, Williams Brothers, through their privilege to discharge vital responsibilities, have constantly broadened their experience, increased their equipment and improved their methods. We are alert to both our responsibilities and opportunities, and are pledged to a policy of intelligent cooperation and service.

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EQUIPMENT MEN . . . in the News

Baash-Ross Advances Administrative Personnel

H. WOTKYNS

Baash-Ross Tool Co. has announced that the following advancements have been made in its administrative personnel: H. Wotkyns, formerly district manager of the Baash-Ross northern Mid-Continent division has

E. M. GEARKE

R. G. WOLF

assumed the duties of domestic sales manager with headquarters at Oklahoma City. To release Wotkyns for his new duties, E. M. Gearke, formerly district manager of the Baash-Ross Rocky Mountain division, has been moved to Oklahoma City.

Gearke's former position as manager of the Baash-Ross Rocky Mountain division will be taken over by R. G. Wolf, who will operate out of the Baash-Ross plant in Casper, Wyo.

Wotkyns has been with Baash-Ross for 14 years and was formerly located in the California area before taking over the managership of the northern Mid-Continent area 4 years ago.

Gearke has been with Baash-Ross for a good many years, working in both California and Oklahoma City areas before moving to his Rocky Mountain post a year ago.

Wolf has had extensive experience in the oil fields, serving for over 12 years in Oklahoma and Kansas fields before taking over as Baash-Ross sales representative in the Kansas area 10 years ago.

Esch-Condit Opens Tulsa, El Paso, Beaumont Offices

Esch-Condit, Inc., Houston, has recently opened sales offices in Tulsa, and El Paso and Beaumont, Tex. Frank L. Mill, formerly with Gulf Engineering, is head of the Tulsa office, and Robert L. Hearn, Jr., formerly with E. I. du Pont de Nemours Co., Inc., is in charge of the Beaumont office.

In West Texas and the El Paso area, George Krutilek is in charge. Esch-Condit's sales personnel in the Houston office are Paul A. Condit, vice president; David G. Founds, Jack C. Walker, and Joe D. Kebelman, sales engineers; and Arnold E. Bruns, warehouseman.

Esch-Condit represents Air-Maze Corp.; Annin Co.; Valve & Primer Corp.; Chartomatic Co.; Clapp Instruments Co.; Honan-Crane Corp.; Kiene Diesel Accessories, Inc.; Manzel, Inc.; Meriam Instrument Co.; Palmer Thermometers, Inc.; Panellit Inc.; and Trinity Equipment Corp.

Whitehurst Made Pacific Coast Sales Representative

S. A. WHITEHURST

The appointment of Stuart A. Whitehurst as Pacific Coast representative of Selas Corp. of America, consulting and manufacturing heat-process engineers, has been announced by Frederic O. Hess, president.

During the past 27 years Whitehurst has been active in industrial designing and operation as well as in sales engineering. With headquarters at Los Angeles, Whitehurst will represent Selas Corp. throughout the Pacific Coast area.

Jarecki Manufacturing Co. Merged With H. K. Porter

T. M. Evans, president of H. K. Porter Co., Inc., has announced the consolidation of Jarecki Manufacturing Co. with H. K. Porter Co., Inc. Hereafter it will be known as the Jarecki Manufacturing Co. Division of H. K. Porter Co., Inc.

Evans has also stated that a number of plans are under consideration for further expansion of H. K. Porter Co.'s activity, these to be announced in the future.

With the consolidation of the Jarecki Manufacturing Co. and H. K. Porter Co., Evans announced the election of W. Howard Pape as vice president of H. K. Porter Co., Inc. Pape will continue in charge of oil-field country distribution.

M. P. Venema Elected Vice President of Universal

David W. Harris, president of Universal Oil Products Co., has announced that M. P. Venema, former-

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G. A. BOCKMAN

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M. P. VENEMA

ly head of the company's patent department, was elected a vice president of Universal at a recent meeting of the board of directors.

A graduate of Armour Institute of Technology (now Illinois Institute of Technology) and Georgetown University in Law, Venema has been associated with Universal since 1935. From 1941 to 1944 he represented Universal's patent department in Washington, and in June of the latter year returned to Chicago to direct the activities of that department, a position he held until elected vice president.

The directors also elected George A. Bockman treasurer. Bockman was formerly assistant treasurer and has been with Universal since 1922. At one time he served as purchasing agent of the company, and was made assistant treasurer in 1941.

Bethlehem Announces Sales Staff Changes

Bethlehem Supply Co. has announced several recent changes in field personnel throughout the organization. R. H. Schlottman, Jr., former field representative at the Hobbs, N. M., store, has been transferred to Corpus Christi, Tex., in the same capacity and will assist in the sales coverage in that store area.

B. K. Smith, former field representative at Corpus Christi, has been transferred to Snyder, Tex., and promoted to the position of store manager to assume the inside managerial duties of the new store. He will work directly with W. B. House, who is in

(Continued on page 333)

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PATENT ATTORNEYS

PATENT Practice before U. S. Patent Office. Validity and Infringement Investigations and Opinions. Booklet and form "Evidence of Conception" forwarded upon request. Lancaster, Allwine & Rommell, Registered Patent Attorneys, Suite 418, 815-15th Street, N.W., Washington 5, D. C.

EQUIPMENT FOR SALE

FOR SALE: Lacoste-Romberg gravity meter complete with many accessories and in good operating condition. Available for immediate delivery. $3,000.00 f.o.b. Houston, Texas. Box D-309, The Oil and Gas Journal, Tulsa, Oklahoma.

HAVE 200,000 feet 7" 20# seamless casing range 2, J55, A.P.I. New prime. F.O.B. Pittsburg, price $129 per ton. A. H. Johnson, 1936 North Clark Street, Chicago, Ill., Phone MO-hawk 4-3200.

FOR SALE

12—230 H.P. Type 10 Bessemer New 17" Power Cylinders complete ready to run with 16" to 18" Compressors. 1—230 H.P. Clark Horizontal with Compressors. Located Salem, Illinois.

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Other Tanks, Too.

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EQUIPMENT FOR SALE

FOR CABLE TOOLS
DEGEN PIPE AND SUPPLY CO.
Box 107, Red Fork Station, Tulsa, Oklahoma

New Wire Rope at Money-Saving Values: Leading brands. Sizes ¼" to 1¼", 6x19, 6x37, construction for all purposes. Degen Pipe & Supply Company, Box 107, Red Fork Station, Tulsa, Oklahoma.

ONE H. D. Failing 1500 Mtd. on New G.M.C. Drill pipe, tools, and accessories. Very cheap. P. K. Kelley, Ph. 54-9764, 208 N.W. 36th Street, Oklahoma City, Oklahoma.

FOR SALE: Two Fairbanks-Morse Diesel Engines, 150 H.P. Twin Cylinder, Horizontal Type. Completely overhauled. $1500.00 each. Melton Supply Co., Seminole, Okla.

FOR SALE: 1 Model QSVSI Cardwell All Steel Single Drum Oil Well Servicing Skid Type Winch, Ser. No. QS-119 powered by Ford V-8 Engine Ser. No. BB18-4103910. Price $900.00. No mast. Contact J. C. Belt, Duncan, Okla., or write Cities Service Oil Co., Patridge, Bartlesville, Oklahoma.

ROTARY special 5,000' used outfit complete with 4,500' of 4½" drill pipe. Ideal unitized draw works $18,500.00. Also core drills, spudders, tools, cable. We handle new and used well drilling equipment. We rent fishing tools. Pressey & Son, Pueblo, Colo.

Several Army Surplus 4½" x 6" Gaso Duplex 1860 Pumps — two piece skid mounted with Chrysler 8 cylinder engines. Will sell pumps only or complete units about half price.

H. H. COFFIELD
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Phones: 132—Rockdale, Texas
A-86064—Houston, Texas

NEW PIPE FOR SALE

(Subject to Prior Sale)

5000 Ft. 9⅝", 36#, J55, Range 2, 8 Rd. Thrd. Seamless Casing
4000 Ft. 8⅝", 28# Ditto
19,000 Ft. 6" Std. Byars L.W. W.I. Pipe

Specification ASTM-AF2-33

Contact

National Cooperative Refinery Assn.
Phone 820 McPherson, Kansas

EQUIPMENT FOR SALE

FOR SALE: 76 Star Spudder SRK Waukesha Motor with or without tools, or trade for smaller spudder. D. B. Wilbur, Centralia, Illinois, P. O. Box 227.

FOR SALE: Approximately 15,000' of 8⅝" O.D. Plain end Line Pipe, in 40 ft. sections. Excellent condition. H. L. Smith, St. Elmo, Illinois, Phone 115.

LINCOLN Electric Pipeline Welding Machine, 250 Amp., equipped with starter & generator. Used approximately 20 hours. Brown Boilers, Inc., Claremore, Oklahoma.

FOR SALE—At Houston, 105,000' of 6" 12.89# Plain End Bevelled Republic Electric Weld #1 Used Line Pipe. Double random lengths. Cities Service Oil Co., Patridge, Bartlesville, Okla.

FOR SALE—10 miles 10¾" OD 40.5# lapweld pipe. This good used line pipe is racked and ready for immediate delivery. Located in Oklahoma. Bethlehem Supply Company, Box 2171, Tulsa 2, Oklahoma.

TWIN 671 GM Diesel power units, 450 hp. with radiator and 1.37-1 reduction. Used 50 hours, $1825 delivered. L. Northrop, 1225 Flanders, La Canada, California.

FOR SALE

New 150,000 bbl., A.P.I. welded type cone deck tanks complete. 150' dia. x 48' high. Available immediate delivery Atlantic Coast Port.

1—New 4x6 Wheatley Oil Shipping Pump complete with electric motor drive.

R. H. TECKLENBORG CO.
811 W. 7th Street, Los Angeles 14, Calif.

BARGAIN

Two **new** Model 6NKU-6NK-20-S "Waukesha" Oilfield Power Units. Latest type—7" x 8½", 225 h.p., equipped with Twin Disc power takeoff, gas pressure gauge, safety magneto, 1 CKU starting unit, radiator cooled. Can be used with butane, natural gas, or gasoline.

Cost $6799 each; will sell for $5835 each, f.o.b. Cut Bank, Montana.

Central Machinery Co.
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USED PIPE FOR SALE

200,000'—8" Line Pipe, cleaned and beveled.
50,000'—6" Line Pipe as taken from ground.
5,840'—18" Line Pipe as taken from ground.
13,800'—20" Line pipe as taken from ground.

Interested parties contact:

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EQUIPMENT FOR SALE

1 FRANK'S well servicing unit mounted on International truck, also 1 Allis-Chalmers E 60 well servicing unit mounted on tandem International truck. Both units equipped with double legged 62-ft. telescope mast. Complete rods & tubing tools. Shafer Well Servicing, 1219 S. Mekusukey, Wewoka, Oklahoma.

NEW Byron Jackson "Pup" Centrifugal Pumping Units with Chrysler Ind-9 engines — Army surplus — export boxed with parts and tools—condition perfect—supply limited—price attractive—available for immediate shipment from Houston.

HALLORAN EQUIPMENT CO.
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Houston 2, Texas

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BOILERS
STATIONARY
160# WP—504 HP—with State inspection certificate.
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Ph.: Los Angeles—LOgan 8-2188

EQUIPMENT FOR SALE

FOR SALE: Moore 65 ft. truck mounted type well servicing derrick. Box D-314, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE—NEW PIPE
420 Ft. 12" Std. 49.56# 3/8" wall, 340 Ft. 8" extra strong 43.38# 1/2" wall. New seamless plain end pipe, low price. Exner-Dodge, Inc., Coffeyville, Kansas.

ONE 8'x27½ Type XYCP National Emulsion Treater complete. Never used, located Basin, Wyoming. Considerable reduction. Write Box 754 or phone 93193, Billings, Montana.

FOR SALE: Approximately 25 miles 4" OD plain end pipe in line. Public Service Corp. of Texas, 902 Burk Burnett Bldg., Fort Worth, Texas.

FOR SALE: One 6-DT-317 and one 4-DC-645 Buda Diesel Engine. New engines at 25% off factory list. R. A. Young & Son, Inc., Fort Smith, Arkansas.

ROLAGRIP COUPLINGS—For Sale, 100 tons, 1½" to 8" inclusive. New, never used, complete with bolts and neoprene gaskets. Price 50% less than manufacturers selling price. Send for list. JULIUS M. FOGELMAN, Reading, Pa.

EQUIPMENT FOR SALE

FOR SALE: Two new welded propane tanks tested 200# cold water pressure, suitable for either propane or butane. Size 54" diameter x 37'6" long, mounted on welded oil field skids, complete with fittings. Tanks never used, located Southern Louisiana. Offered at bargain price. Wire or phone Bethlehem Supply Company, Tulsa, Oklahoma.

FOR SALE: 3 New 10,000 bbl. A.P.I. Columbian Bolted Steel Tanks. 160—8000 & 10,000 Gal. Tank Cars. Darien Corp., 60 E. 42nd St., N. Y., N. Y.

A BARGAIN!
FRED E. COOPER
Self-Propelled
TUBING UNIT

Model W-201—26" double drum winch tractor—WT-350-4 cyl. 4" x 4" engine—front drum 33" between flanges with 26" dia. x 5" face brakes—rear drum 30" between flanges with 26" dia. x 5" face brakes—front controls—starting equipment—15 M.P.H. road speed—Cathead-drum divider—50 ft. height—3 sheave-single pole mast—Radiator guard—Extra set of locking dogs—7/8" x 450' non-rotating tubing line—Single sheave McKissick traveling block—Set Elevator Bales—Set 2" regular BJ tubing elevators—Set 2" Upset Elevators—7/8" x 1800' Sand line—7/8" tubing line safety clip—Set Mission tubing spider and slips—2 tool boxes—Set 2" Petol tubing tongs.

Purchased New—Used 6 Months

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EQUIPMENT WANTED

WANTED: Portable trailer or truck mounted Rotary suitable for 2500' drilling. Wish to exchange 1500' truck mounted rotary and pay difference. No junk. Box 378, Cherryvale, Kansas.

WANTED: COMPLETE, truck mounted rotary water well rig and tools, ready to drill, 800 to 1000 foot capacity. Must state total or individual prices. Box D-317, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

ENGINEERS, Executives, Technical Men. Salaried positions—$3600 to $30,000. This confidential service for outstanding men who desire a change of connection, will develop and conduct preliminary negotiations without risk to present position. Send name and address for details. Tomsett Associates, 1204 Berger Bldg., Pittsburgh 19, Pa.

WANTED: Graduate Petroleum Engineer for work in Mexico. Minimum five years' experience in completion and production of flowing wells. Knowledge of Spanish desirable. Salary open, depending on experience. Box D-305, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Civil Engineer capable of registering in any Southern State including Florida. Experience on Natural Gas Distribution Systems preferred. Address: Littrell Engin. & Constr. Co., Inc., Moultrie, Georgia.

Wanted
CHIEF ENGINEER

—for major well-known manufacturer of well head controls, plug and gate valves, and other drilling and producing equipment for the oil industry.

Engineer must have degree, experience, reputation and record of successful accomplishment in actual designing and development. Should now be employed. All inquiries will be kept confidential. Reply giving full details of experience, personal status, expected compensation and a recent photograph.

Reply to Box D-318, The Oil and Gas Journal, Tulsa, Oklahoma

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4—3'x12'x7/16" thick shell and heads, 260 ≠ w.p.
1—5'6"x13'x3/4" thick shell and heads, 275 ≠ w.p.
1—5'x13'x3/4" thick shell and heads, 305 ≠ w.p.
4—4'6"x20'x7/16" thick shell and heads, 150 ≠ w.p.
2—36"x8' wi 14" skirt, 275 ≠ w.p.
1—3'6"x72'x7/16"x9/16" shell x 7/16" top head x 9/16" bottom head, 25 tray absorber, 160 ≠ w.p. @ 150°F, mounted on 10'4" skirt.
1—6'x68'x1/2" thick shell and head, 30 tray stripper, 150 ≠ w.p. @ 500°F, radiographed, mounted on 14'6" skirt.
1—5'6"x70'x1" thick shell and heads, 30 trays depropanizer, 350 ≠ w.p. @ 300°F, stress relieved and radiographed, mounted on 5' skirt.
1—3'6"x16'x3/8" thick shell and heads, reflux accumulator.
1—7'x30'x9/16" thick shell and heads, 170 ≠ w.p.
1—5'x16'x15/16" thick shell and heads, 400 ≠ w.p.
1—7'x30'x5/8" thick shell and heads, 180 ≠ w.p.
1—5'x16'x1/2" thick shell and heads, 150 ≠ w. p. stress relieved and radiographed.
3—24"x4'x1/4" thick shell and heads, 50 ≠ w.p.
1—20x"4'11/16"x3/8" thick shell and heads, 200 ≠ w.p. @ 150°F.
1—3'x6'x3/8" thick shell and heads, 125 ≠ w.p. @ 150 F, stress relieved.
1—5'x16'x13/16" thick shell and heads, 250 ≠ w.p. @ 200°F.
1—5'6"x50'x7/8" thick shell and heads, 20 tray 88 rerun column, 250 ≠ w.p. @ 300°F, stress relieved and radiographed.
3—6'10"x21'6"x7/8" thick shell and heads, Stratco contactors wi inner shell 5'3⅜"x15'7"x1/2" thick shell and heads and G-R tube bundle 1½" steel pipe and 3.37" OD G. fins, shells stress relieved.
1—12'x66'x3/4" thick shell and heads, 29 tray stripper column, 100 ≠ w.p. @ 200°F, stress relieved and radiographed, mounted on 9'4" skirt.
2—12'6"x85'5"x1" thick shell x 3/8' thick heads, 40 tray extractor columns, 150 ≠ w.p. @ 300°F, radiographed only, mounted on 16'7" skirt.
2—12'x22'x15/16" thick shell and heads, 150 ≠ w.p. @ 200°F, radiographed.
1—3'x7'x1/4" thick shell and heads, 50 ≠ w.p. @ 300°F.
2—6'x38'x7/8" thick shell and heads, 250 ≠ w.p. @ 300°F, stress relieved and radiographed.
1—7'x60'x9/16" thick shell and heads, 25 tray concentrator, 150 ≠ w.p. @ 450°F, mounted on 5'11" skirt.
1—3'x5'x5/16" thick shell and heads, 50 ≠ w.p. @ 350°F.
1—7'x30'x9/16" thick shell and heads, 150 ≠ w.p. @ 200°F, stress relieved and radiographed.
1—3'6"x16'x5/16" thick shell and heads, 50 ≠ w.p. @ 200°F.
1—4'6"x16'x3/4" thick shell and heads, 110 ≠ w.p. @ 150°F.
1—8'x20'x3/8" thick shell and heads, 50 ≠ w.p. @ 180°F.
1—6'x4'10"x7/16" thick shell and heads.
1—6'x13'x5/16" thick shell and bottom, open top.
2—36"x8', 275 ≠ w.p. air receivers, National Board stamped, mounted on 14" skirt.
1—3'x6'x3/8" thick shell and heads, 125 ≠ w.p. @ 150°F, stress relieved, mounted on 2'9" dia x 6" high skirt.
4—3'x12'3"x3/8" thick shell x 7/16" thick heads, 180 ≠ w.p. @ 650°F, stress relieved and radiographed.
1—10'x25'x11/16" thick shell and heads, 100 P.S.I. vacuum 15" @ 250°F, stress relieved and radiographed.
1—6'x8'x1/4" thick shell and heads.
1—4'6"x10'x1/4" thick shell and heads, 50 ≠ w.p. @ 150°F.
1—3'6"x30'x1/2" thick shell and heads, 10 tray regeneration column, 175 ≠ w.p. @ 450°F, stress relieved and radiographed, mounted on 4'9" skirt.
1—3'6"x30'x1" thick shell and heads, 6 side pans, regeneration column, 250 ≠ w.p. @ 450°F, stress relieved and radiographed, mounted on a 4'9" skirt.
1—12'x33'x1-1/16" thick shell and heads, 155 ≠ w.p. @ 200°F, stress relieved and radiographed.
1—4'x16'x9 16" thick shell and heads, 175 ≠ w.p. @ 150°F, stress relieved.
1—3'6"x6'x3/8" thick shell and heads.
1—11'x45'x1½" thick shell and heads, 180 ≠ w.p., stress relieved and radiographed.
2—8"x3' scrubber, 50 ≠ w.p.
1—24"x5'x1/4" thick shell and heads, 50 ≠ w.p.
1—3'6"x5'x1/4" thick shell and heads, 35 ≠ w.p.
1—3'6"x15'x5 16" thick shell and heads, 100 ≠ w.p. @ 200°F.
1—15½"x58"x1/2" thick shell x ½" flgd. head x ½" conical bottom.
1—4'x26'x5 16" thick shell and heads, 35 ≠ w.p. @ 150°F, mounted on 8' skirt.
1—7'x40'x3/8" thick shell and heads, 50 ≠ w.p. @ 150°F.
2—2'6"x15'x3/8" thick shell and heads, 150 ≠ w.p. @ 450°F.
1—3'x25'x3/8" thick shell and heads, 175 ≠ w.p. @ 200°F, mounted on 3' skirt.
1—4'x16'x1/2" thick shell and heads, 175 ≠ w.p. @ 200°F.
1—4'6"x16'x1/2" thick shell and heads, 150 ≠ w.p. @ 200°F.
1—4'6"x50'x3/8 thick shell and heads, 20 tray rerun column, 50 ≠ w.p. @ 450°F, mounted on 10' skirt.
1—6'x15'x5/16" thick shell and heads.

DULIEN STEEL PRODUCTS, INC
of Washington
P. O. BOX 667
COTTON VALLEY, LA.
PHONE: COTTON VALLEY 26

HELP WANTED

EXPERIENCED seismologist for work in division office. Must be capable of highest type seismic interpretative work. Permanent position. Good future. Give full details of education, experience, age, and availability in first letter. All replies held confidential. Address Sun Oil Company, attention L. G. Ellis, Box 2831, Beaumont, Texas.

NEW foreign and domestic Oil Employment Directory. Over 500 listings in drilling, production, refining, natural gasoline, pipe lines, geological, exploration, supplies, manufacturers, services; and trucking, refinery and pipe line contractors, showing where to apply for jobs. Price $5.00. Oil Industry Mailing List, Box 2603, Tulsa, Okla. (Our 28th year).

SITUATIONS WANTED

ATTENTION: Well established oil well drilling contractor desires to manage and supervise: Individuals', groups', small or medium-sized oil companies' drilling, production and operating problems in Central and Western Texas, and New Mexico. Personal interview by appointment is desired. Makin Drilling Company, Box No 131, Ph. No. 131, Hobbs, New Mexico.

PRODUCTION Superintendent, graduate petroleum engineer, 36, experienced all phases drilling, completion, production. Desire responsible connection with active organization. Excellent references. Box D-295, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM Engineer: 4 years experience in drilling, production, and reservoir engineering. Want work with Major or Independent preferably in Mid-Continent Area but will go anywhere. 27 years old and single. Excellent recommendations. Box D-310, The Oil and Gas Journal, Tulsa, Okla.

GEOLOGIST, B.S., 3½ yrs. subsurface experience in Cuba and Venezuela, desires a position with aggressive company, preferably domestic. Box D-308, The Oil and Gas Journal, Tulsa, Oklahoma.

BUSINESS manager, contact man. Fourteen years in drilling industry. Age 36. Box D-303, The Oil and Gas Journal, Tulsa, Oklahoma.

DESIRES CHANGE: Refining and Production Material Man. Experienced in Auditing, Inventory, Control, Purchasing and Sales. Can furnish the best of references. Age 35. Box D-302, The Oil and Gas Journal, Tulsa, Oklahoma.

MECHANICAL ENGINEER: B. S., 2½ years Refinery and Gasoline Plant Design, 4 years Glitsch Tray Design. Married, Age 28. Available January 1. Box D-296, The Oil and Gas Journal, Tulsa, Oklahoma.

DESIRE EMPLOYMENT. Experience in gas measurement, pipeline operations, land and lease, survey and oil field construction. 32, reliable, salary $250 month. Box 1393, Sapulpa, Oklahoma.

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BURKHART LEGAL BLANKS since 1908. Oil-Gas (all states), Business, Real Estate, Legal Forms, Leases, Revised With Government Regulations, Commercial Printing, Catalog and Samples on request. Burkhart Printing & Stationery Company, 115 South Cincinnati, Tulsa 3, Oklahoma.

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FOR SALE: Installation of steel shelving in our legal department creates surplus of used oak bookcases. Full details upon request. Cities Service Oil Co., Patridge, Bartlesville, Okla.

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DEEDED ROYALTIES

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OIL LANDS available Western Canada. Freehold leases and reservations from one hundred and sixty to one million acres. Reference—any bank in Toronto, Ontario. Gordon Jones, 200 Bay Street, Toronto, Canada.

EXTRA well located. Great San Juan Basin, New Mexico. 11,000 acres, ten year leases 25c acre rentals. All one lease. $2.50 acre, small oil payment. Opportunity, lifetime. Box D-304, The Oil and Gas Journal, Tulsa, Oklahoma.

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TAX PROBLEMS IN DEVELOPMENT AND OPERATION OF OIL PROPERTIES — John W. Beveridge

TAX PROBLEMS IN SALES AND ASSIGNMENTS OF LEASES AND OTHER INTERESTS IN OIL AND GAS — Frank B. Appleman

TAX PROBLEMS IN EXCHANGES OF OIL PROPERTIES AND RELATED TRANSACTIONS — William O. Taylor

OPERATING AND UNITIZATION AGREEMENTS—INCOME TAX CONSEQUENCES UPON OPERATORS AND NON-OPERATORS — J. Q. Weatherly

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OFFICE SPACE

OFFICE OR DESK space rental in new uptown Tulsa building. Telephone and stenographic service provided. Mr. McGilvray, 237 West 12th, Apt. 4, Tulsa 14, Oklahoma.

Oklahoma Fields

(Continued from page 321)

Lincoln County: Hubbell 1 Bonner, NE NE SW 9-16n-3e, dry, TD 4,415 ft.

Logan County: Republic Natural Gas Co. 1 Howland, SE SE SE 26-18n-2w, dry, TD 5,919 ft.

Pittsburg County: Shaller 1 Smith, NW NE SE 33-2n-15e, dry, TD 518 ft.

British-American Oil Co. 1 Childers Ranch, SE NW SW 7-5n-14e, dry, TD 7,963 ft.

Pontotoc County: Jones & Shelborn 1 Jones, SE SE NW 15-4n-5e, dry, 2,215 ft.

Booth 1 Brown, NE NE SE 29-5n-4e, dry, TD 2,781 ft.

Seminole County: Derby Drilling Co. 1 McGirt, SW NE SE 19-6n-8e, dry, TD 3,005 ft.

Crosbie 1 Jimsey, SE SW NE 27-8n-5e, dry, TD 4,485 ft.

Illinois

(Continued from page 321)

it found the sand somewhat lower and relatively tight.

ILLINOIS SUCCESSFUL WILDCATS

Bond County: T. R. Kerwin 1 Howard, NE NE NW 30-7n-3w, IP 250,000 cu. ft. gas, Benoist 870-82 ft., TD 889 ft.

Wabash County: Ashland Oil & Refining Co. et al 1 Kortage, NW SE NW 21-1n-13w, IP 94 bbl., Benoist 2,518-24 ft., TD 2,529 ft. (Opens new pool.)

ILLINOIS WILDCAT FAILURES

Christian County: Ashland Oil & Refining Co. et al 1 Waters, SW SE SW 3-14n-3w, dry, TD 1,970 ft.

Clark County: F. B. Cline 1 Ramsey, SW SE SW 29-12n-10w, dry, TD 2,113 ft.

Coles County: E. Zink et al 1 Childress Estate, NE NE NE 19-13n-14w, dry, TD 1,195 ft.

Edgar County: Jones & Simpson 1 Steele, SW NW NW 4-14n-11w, dry, TD 2,202 ft.

C. E. Skiles 1 Gumm, NW SW SE 20-13n-11w, dry, TD 1,136 ft.

C. E. Skiles 2 McDavitt, SE NW SE 29-13n-13w, dry, TD 475 ft.

Nation Oil Co. 1 Stewart, NW NW SE 30-13n-11w, dry, TD 1,215 ft.

F. E. Fell 1 N. Fell, NW NW NE 10-13n-14w, dry, TD 364 ft.

Effingham County: Ryan Oil Co. 1 Goekner, SE NE SW 24-7n-6e, dry, TD 2,775 ft.

Franklin County: W. G. Fortner 1 Seymour Heirs, NW SE NE 22-5s-3e, dry, TD 3,149 ft.

Jasper County: Illinois Mid-Continent Co. 1 Mitchell, NE NE SW 22-7n-9e, dry, TD 2,966 ft.

Jefferson County: R. M. Baker 1 Dare, SE NE SE 33-2s-2e, dry, TD 2,578 ft.

Lawrence County: J. L. Black 1 Heath, NE NE SW 34-4n-13w, dry, TD 2,429 ft.

Ryan & Sharp 1 Driver et al, NE SE SE 12-2n-12w, dry, TD 1,976 ft.

Buckman & O'Neal 1 Quick, SE SE NW 22-2n-12w, dry, TD 2,192 ft.

Madison County: Carl Wilson 1 Schleple, C E½ NW NW 29-6n-6w, dry, TD 572 ft.

Marion County: Nash Redwine 1 O'Donley, SW SE NW 11-4n-3e, dry, TD 2,314 ft.

Washington County: M & M Drilling Co. 1 Haier, NE SE NW 29-2s-4w, dry, TD 3,292 ft.

EQUIPMENT MEN

(Continued from page 329)

charge of all sales activity in the Snyder area.

H. G. Nelson, field representative, has been transferred from the Alice, Tex., store to the Corpus Christi store. R. P. Finger, former floor man in the Alice store, has been promoted to the position of field representative and will work field sales from that point.

L. F. Ritchie, former service representative in the field service department, has been transferred into the sales department as field representative and will assist in sales representation out of the Odessa, Tex., store.

B. M. Quigley, recently employed as field representative at the Odessa and Sundown, Tex., stores, has been transferred to Hobbs, to work field sales in that area. D. S. Counsil, formerly of the Tulsa general office, has been transferred to Snyder, as field representative. C. A. Ritchey, former floor man at Cisco, Tex., has been promoted to assistant store manager of the Cisco store.

Iverson Supply Announces Sales Staff Changes

Ed. Robertson, sales manager for Iverson Supply Co., has announced several changes in the company's staff, in Texas.

R. B. Yanaway has been transferred from Fort Worth to Houston in the capacity of district sales manager. J. H. Beard, formerly field salesman at Odessa, has been moved to the Fort Worth office in the capacity of city salesman for Fort Worth and Dallas. E. E. Jackson, formerly field salesman at Kermit, has been transferred to Odessa in the same capacity.

CALENDAR

January

Society of Automotive Engineers, annual meeting Hotel Book-Cadillac, Detroit, January 9-13.

February

Southern Gas Association, meter and regulator conference, Houston, February 9-10.

American Institute of Mining and Metallurgical Engineers, annual meeting, Hotel Statler, New York, February 12-16.

American Institute of Chemical Engineers, regional meeting, Houston, February 26-March 1.

American Society for Testing Materials, spring meeting, Hotel William Penn, Pittsburgh, February 27-March 3.

March

American Petroleum Institute, Division of Production, Southwestern District meeting, Adolphus Hotel, Dallas, March 8-10.

Indiana Independent Petroleum Association, spring convention, Hotel Severin, Indianapolis, March 9-10.

North Texas Oil and Gas Association, Kemp Hotel, Wichita Falls, March 25.

Southern Gas Association, Galveston, Tex., March 27-29.

Western Petroleum Refiners Association, annual meeting, Plaza Hotel, San Antonio, March 27-29.

American Petroleum Institute, Division of Production, Mid-Continent district meeting, Skirvin Hotel, Oklahoma City, March 29-31.

April

National Association of Corrosion Engineers, annual conference, Jefferson Hotel, St. Louis, Mo., April 4-7.

American Society of Mechanical Engineers, Hotel Statler, Washington, D. C., April 10-14.

Southwestern Gas Measurement Short Course, University of Oklahoma, Norman, Okla., April 11-13.

National Petroleum Association, Hotel Cleveland, Cleveland, Ohio, April 12-14.

American Petroleum Institute, Division of Production, Rocky Mountain district meeting, Gladstone Hotel, Casper, Wyo., April 13-14.

Natural Gasoline Association of America, annual convention, Texas Hotel, Fort Worth, April 24-26.

American Petroleum Institute, Division of Production, eastern district meeting, Cleveland Hotel, Cleveland, April 26-28.

May

American Petroleum Institute, Division of Refining, midyear meeting, Hotel Cleveland, Cleveland, May 1-4.

Interstate Oil Compact Commission, spring meeting, Biloxi, Miss., May 4-6.

Independent Petroleum Association of America, midyear meeting, Biltmore Hotel, Los Angeles, May 7-9.

American Gas Association, Natural Gas Department, spring meeting, Mayo Hotel, Tulsa, May 8-9.

American Petroleum Institute, Division of Production, Pacific Coast district meeting, Biltmore Hotel, Los Angeles, May 11-12.

NOMADS

Tulsa Nomads, third Friday of each month. After Five Room, Tulsa Hotel.

Dallas Nomads, first Monday of each month, Texas Room, Baker Hotel.

Houston Nomads, second Monday of each month, Ye Ole College Inn, Houston.

Los Angeles Nomads, second Wednesday of each month, Jonathan Club.

New York Nomads, election and business meeting, Louis Sherry's, January 9.

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Indiana Fields

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brought under control. Flow is estimated at 1,250,000 cu. ft. per day with a pressure of 750 psi. Total depth is 1,525 ft.

Ashland Oil & Refining Co. and associates 1 Helm-Powell, NW NW SW 23-6s-8w, Warrick County, south offset to V-T Drilling Co. 1 Helm, recently completed discovery well of the Pelzer pool, 5 miles south of Boonville, recovered 410 ft. of clean oil and 10 ft. of oil-cut mud in a drill-stem of the discovery well's Cypress sand pay zone at 1,595-97 ft. Casing was run to the top of the zone, and with plug drilled out, production tests are being started.

INDIANA SUCCESSFUL WILDCATS

Gibson County: L. L. Chevalier 1 Bensch, SE NE SW 7-2s-11w, IP 126 bbl. McClosky 2,280-85 ft., TD 2,288 ft.

Posey County: C. E. Skiles 1 Meier, SE NE SW 7-6s-12w, IP 96 bbl., Mansfield 1,120-40 ft., TD 1,140 ft.

INDIANA WILDCAT FAILURES

Gibson County: Evans & Dobbs 1 Knowles, SW NW SE 3-3s-11w, dry, TD 2,350 ft. W. L. Griffith 1 Price, SE SW NE 32-3s-12w, dry, TD 2,807 ft.

Sullivan County: Illinois Mid-Continent Co. 1 Carmichael, SW SE SE 13-8n-10w, dry, TD 2,634 ft.

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